STS Consultants, Ltd.
Solutions through Science & Engineering

July 26, 2001

Mr. Fred Micke, On-Scene Coordinator
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Boulevard., SE-5J
Chicago, Illinois 60604

RE: Response to Comments regarding 341 East Ohio Street Workplan - STS Project No. 1-25585-XG

Dear Mr. Micke:

The following presents the incorporation of the U.S. Environmental Protection Agency (USEPA) comments into the 341 East Ohio Work Plan, with accompanying attachments.

General Comments

1) Overall, the Standard Operating Procedures (SOPS) should be revised to reflect the work being performed in Streeterville and not in West Chicago.

We have changed references from West Chicago to Streeterville.

Specific Comments

Revised Work Plan is included in Attachment 1.

2) **See. 1.0, SCOPE AND OBJECTIVES, Page 1**: Add details about Velsicol's prior ownership/operation of property.

The following was inserted to the Work Plan:

The site has historically been used for several different purposes, including buildings used to support supply and wholesale distributors; shipping and receiving operations; an experimental lab, a machine shop, printing and lithography operations and a waxed paper manufacturer. Velsicol Chemical Corporation (Velsicol) used all of the site buildings constructed by the previous occupants as their corporate headquarters and as research and development laboratories for herbicides, insecticides and plant growth regulators from as early as 1917. Foundations and basements from these buildings are expected to be found on the property during the excavation and removal action process.

3) **See. 1.0, SCOPE AND OBJECTIVES, Page 3 (ii):** Insert "no further radiological investigation or removal action is required..."(5th from the last sentence on this page)

Suggested wording was inserted.

4) **Sec. 2.3, Project Management Structure, Page 5**: Add s to (OSC), therefore, (OSCs).

Suggested wording was inserted.

5) **Sec. 2.3, Project Management Structure, Page 6, First paragraph**: This section must state the name of the project team, project manager, etc.

The following was inserted:

The TRS Project Team consists of the following members:

- TRS Project Manager, Mr. Tim Ramsey
- STS Project Coordinator, Mr. Richard Berggreen
- Quality Assurance Manager, Mr. Ron Palmieri
- STS Project Manager, Ms. Julie Apolinario
- STS Field Team Leader, Mr. Dumas Guerrier
- Health and Safety Officer, Mr. Glen Huber
- Kerr-McGee, Mr. Mark Krippel
- Health Physicist Supervisor, Mr. Steve Carlson

6) **Sec. 2.4, Delineation and Design, Page 7:** The wedge of material remaining on-site will need to be carefully surveyed in order to determine that this material is "clean". Many borings and/or lifts of material will be needed to conduct this survey work. The design for this work must be approved by this Agency before the Plan will be approved.

The following was inserted:

The wedge of material remaining unexcavated on-site will be sloped as steeply as can be safely accomplished without endangering the adjacent right-of-way, likely on the order of 1 V:1.5 H. Prior to excavation, this wedge of material will be surveyed for elevated gamma radiation utilizing a series of borings on a 2-meter square grid. The Work Plan detailing the proposed slope survey was submitted to USEPA by STS on July 18, 2001. Pending approval by USEPA, this Work Plan will be utilized to confirm that the slope materials are "clean". Any identified radiologically impacted material will be removed to the property line during the excavation phase of the project.

This design detail and the results of the slope survey will be provided as part of any bid package to contractors who might be invited to bid on the proposed excavation

and removal work. The design will be submitted for review and will conform to the requirements of the appropriate public agency or governmental oversight unit.

7) **Sec. 3.1.5, Excavation Work, Page 14, Second paragraph**: Provisions must also be made for the staging of "Baker Boxes".

The following was inserted:

Arrangements for the use of "Baker Boxes" will be made before construction starts; site mobilization will include provisions for the staging of these boxes as soon as they are needed.

8) **Section 3.1.1, Site Preparation, Page 11, First paragraph**: This section should mention that structures/Foundations from Velsicol should be expected.

Inserted as suggested.

9) **Section 3.4.3,Training, page 25, First paragraph**: Federal requirements must take precedence over State requirements as noted in the footnote on page 11 of Attachment 3.

"As noted in the Health and Safety Plan, Federal safety requirements take precedence over state requirements. "

10) **Section 3.4.3, Second paragraph**: Training should also include radiation basics.

Included as noted

11) **Section 3.4.3, Third paragraph**: Tailgate meetings may be needed more often than weekly.

Included as noted.

12) **Section 3.4.5, Monitoring, Page 26, First paragraph**: A primary requirement of dust control is "no visible dust."

"A primary requirement of dust control is "no visible dust"."

13) **Section 3.5, Application of ALARA to Excavation, Page 27, Second paragraph**: USEPA has an oversight role. It is not involved directly in cleanup.
"ALARA and the numerical criterion will be met through a coordinated program of surveys and verification conducted by TRS. USEPA will provide oversight role in the application of ALARA to the excavation activities."

14) **Project Management Organization Chart**: USEPA does not report to the STS Project Coordinator. USEPA has an independent role.

Changed as noted, see attached organization chart.

Attachment 1, Section 01020, Construction Health and Safety

Revised Construction Health and Safety is included in Attachment 2.

15) **Part 3 - Execution, Page 1, Paragraph d**: State specifically where emergency rescue equipment such as breathing apparatus, safety harness, etc. will be located.

"d. Emergency rescue equipment such as breathing apparatus, a safety harness and line, etc., will be readily available in the project trailer."

16) **Sec. 3.2, Training, Page 3**: Add that there will be a competent person for shoring.

Inserted as suggested.

Attachment 1, Section 02200, Contaminated Material Loadout and Transport

Revised Contaminated Material Loadout and Transport is included in Attachment 3.

17) **Sec. 2.6, B, Loadout, Page 10**: Will portable scales be present?

The following was inserted:

2. Portable scales will be present at the loadout and equipment decontamination facilities for use where loadout is occurring.

Attachment 1, Section 02840, Site Utilities

Revised Site Utilities is included in Attachment 4.

18) **Sec. 3.4, Underground Utility Installations, Page 50, Paragraph D, Trench Preparation**: Delete "at t2%"

Deleted as noted.

Standard Operating Procedure, SOP-212, Air Monitoring Procedure

Revised Air Monitoring Procedure is included in Attachment 5.

19) **Section 5.1, Page 3**: Delete use of REF background air monitoring station #17. A location closer to Streeterville must be found.

The SOP has been revised to reflect a location closer to the project site. This SOP was revised to more adequately address air monitoring activities:

One downwind, high volume air sample shall be collected for a minimum of eight hours prior to the commencement of excavation activities. This sample shall be analyzed the day after collection and then again after four days to allow for the decay of short lived radon and thoron daughters. The count, after four days decay, will serve as the official measurement of the background airborne alpha concentration. Future results during Site operations should be compared to this value to see if further engineering controls or procedural changes are warranted.

20) **Section 5.4.2, Page 4**: Counting filters at the REF?

This SOP was revised to more adequately address air monitoring activities, including more specific references to filter measurements:

Four air monitoring locations shall be used during all excavation activities. Samples shall be collected during all operations where potentially contaminated soils are being excavated, moved, or loaded. One monitor shall be placed on each perimeter of the site (North, South, East, and West) and collect samples at a height between one and two meters above the ground. Flow rate through air samples shall remain between 20 and 60 cubic feet per minute. Air sample filters shall be collected and replaced daily and submitted to the laboratory for analysis. Samples analyzed from the perimeter high volume monitors shall be used to determine the amount of airborne radionuclides leaving the Site.

Attachment 3, Health and Safety Plan

Revised Health and Safety Plan is included in Attachment 6.

21) **General comment**: The specific names and resumes of key managers such as the Health and Safety Coordinator and the Field Team Leader must be included in this document.

Mr. Glen Huber has been named as the Health and Safety Coordinator, and Mr. Dumas Guerrier has been named as the Field Team Leader. All other key personnel

have been named as well. Resumes of key personnel not included in the original work plan have included in the revised Health and Safety Plan.

22) **Figure 1.1, Page 2, next to last sentence at bottom of page**: This is not a USNRC licensed site.

This reference has been removed.

23) **Section 2.1, Page 3, Last bullet**: This sentence is unclear. Will this be simply an administrative function or will this coordinator be monitoring the air and counting the filters for concentration measurements?

The sentence has been revised as follows:

- Administer personnel and perform ambient air monitoring procedures.

24) **Section 3.0, Personnel Responsibilities, Page 4, Second paragraph**: Will the Field Team Leader conduct any training on radiation or any periodic briefings on radiation matters? This paragraph does not commit to that.

The paragraph has been revised as follows:

The Field Team Leader, Mr. Dumas Guerrier, will conduct tailgate safety meetings to familiarize the Site personnel with Site conditions, boundaries, and physical hazards. Site personnel will conduct their assigned tasks in accordance with the HASP at all times. As necessary, the Field Team Leader will conduct radiation training and provide briefings on radiation issues that arise during construction. These activities will take place as part of the tailgate safety meetings, or during special meetings to address more immediate concerns, dependent on the issues being addressed.

25) **Section 4.1, Page 6**: The title for this section should include the word "radioactive," as Principal Radioactive Contaminants.

Revised as noted.

26) **Section 4.1, bullets**: The hazards include the entire thorium (Th-232) and uranium (U-238) decay chains. There are two (2) radiums which have been singled out (Ra-226, Ra-228). Both radons (Rn-220, Rn-222) are potential hazards.

Revised as noted.

27) **Section 4.1, Sentence after bullets**: The known total radium concentration exceeds 3000 picocuries per gram. This should not be cited as a low concentration.

Revised as follows:

The known total radium concentration present in the soil exceeds 3000 pCi/g for some locations within the project site.

28) **Section 4.1, Route, Entry Made Via**: Inhalation should include radon which is not a heavy metal. Direct exposure can also occur from X-rays.

Revised with inclusions as noted.

29) **Section 4.3.1, Dosimetry/Personal Monitoring, Page 11**: Project Health Physics Personnel is nonspecific. There must be a specific project manager.

The paragraph has been revised as follows:

All project personnel shall participate in a dosimetry program administered by the HSC. (The dosimetry program shall comply with 32 IAC 340; i.e., dosimeters shall be processed by a dosimetry processor accredited by the National Voluntary Laboratory Accreditation Program.) The HSC shall maintain records of all radiation exposures incurred by field personnel including all contractors. These records will be maintained in an up-to-date manner to comply with the requirements of 32 IAC 340.4010. The HSC shall review the results of personal exposure monitoring to determine compliance with exposure limit requirements.

30) **Section 4.3.3, Bioassay, Page 12, Second paragraph**: The decision to use bioassay should not be based just on dosimetry. If there were an excessive intake, there could be a need for immediate bioassay that would not require any dosimetry justification.

The determination should be made by a specific, designated manager such as the Health and Safety Coordinator or the Field Team Leader. Project Health Physics personnel is nonspecific.

The paragraph has been revised as follows:

The decision to use bioassay shall be made by the Health and Safety Coordinator. In the event that a worker has an excessive intake or the potential to receive greater than 10% of the Annual Limit on Intake (ALI) , bioassay shall be ordered. Data from Lapel Air Samplers shall be used as a factor in determining whether or not bioassay is warranted. If workers are found to have been present in locations where airborne

radioactivity concentrations are found to be greater than 30% of the Derived Air Concentration, bioassay will be considered.

31) **Section 4.3.4, Emergency Medical Treatment, Page 13, bullets**: There should be an individual trained specifically on radiation emergency response.

Revised as noted.

32) **Section 5.1, Page 17, Bullets**: Training must include radiation in general as well as the hazards.

Revised as noted.

33) **Section 5.3, Page 18**: Tailgate meetings, as needed, should be held more often than weekly.

Revised as follows:

Additional meetings will be conducted throughout the week, as needed, to address safety concerns and precautions.

34) **Section 5.4, Page 18**: This trained individual should be trained in radiological response as well.

Revised as noted.

35) **Safety Meeting Report**: Supervisor and Department Head are not titles specific to this project. The appropriate titles should be applied.

Figure 5.1 has been revised and is attached to this document.

36) **Figure 5.2**: Has this apparently Kerr-McGee form been reviewed for applicability to this site specifically?

Figure 5.2 has been revised and is attached to this document.

37) **Section 7.1, Page 28**: A key control mechanism should be stated as "no visible dust.

The paragraph has been revised as follows:

A key control measure to minimize exposure levels and off-site migration of contaminants will be a policy of "no visible dust".

38) **Section 7.2, Page 28, Bullets**: Monitoring also includes counting filters, computing concentrations and comparing concentrations to criteria.

The bullets have been revised as follows:

Monitoring for airborne radioactivity exposure requires the following elements:

- Air sampling for radioactive particulates,
- Recordkeeping regarding personnel work locations and time in location,
- Respiratory protective equipment records regarding devices used by workers in airborne radioactivity areas,
- Counting and analyzing air sample filters,
- Calculating air concentrations of radioactive material, and
- Comparing air concentrations to applicable air quality criteria

39) **Section 7.2, Paragraph beginning with "Lapel"**: This paragraph is vague. Air filters can be read on a daily basis to assess for the need to make procedural changes, but, for most filters, they cannot be read on a daily basis. The method must be specific in this section. How will the interferences be handled specifically? How much time will be allowed for decay? These are some of the specific issues that should be addressed in this section.

The paragraph has been revised as follows:

Lapel samplers worn for personal air monitoring shall be utilized for airborne radioactivity monitoring any time a worker enters a radiological exclusion zone. The filters from the lapel samplers shall be analyzed the following day after use for comparison purposes to assess the need for procedural changes. It is expected that naturally occurring radon and thorium daughters will interfere with analyses. Additional evaluation of samples shall be performed when determined necessary based upon elevated results. If sample analysis shows concentrations greater than background levels a follow-up analysis shall be performed. The follow-up analysis shall be performed after four days to allow for the decay of the thoron daughter Pb-212 (10.6 hour half life). The "four day count" should be free from radon daughter interference and will serve as the official measurement of Th-Alpha.

40) **Section 7.2, page 28, Last paragraph**: If high volume samplers are used, then dust buildup will be an issue because a thick dust layer will shield out alpha particle emissions and give incorrect air concentrations. Low volume samplers are more appropriate. Depending upon the collection and analytical protocols, daily measurements of concentration may not be possible except to qualitatively compare one day to the next.

The paragraph has been revised as follows:

Low volume air samplers shall run continuously during operations and be evaluated on a daily basis for gross alpha activity.

41) **Section 7.2, Page 29, Last paragraph**: The specificity in this paragraph is good and could be used to improve other, vague, sections.

As noted.

42) **Section 7.5, Page 30**: There are no regulatory limits, specifically, for this project but there are relevant and appropriate requirements that must be conformed to.

The primary instruments for this project will probably be the sodium iodide count rate and a Geiger counter. The first for seek and find work and for soil concentration judgments. The later for personnel surveillance. A micro-R meter could be used periodically but would not be a primary instrument. This paragraph should be improved with these ideas in mind.

This section has been revised as follows:

Radiological surveys will be performed to ensure that radiation levels and contamination levels are within applicable guidelines for workers and the general public. Radiation surveys will be performed using the following instrumentation:

- Ludlum Model 2221 Portable Scaler/Ratemeter with 2"x2" NaI probe (or equivalent). This instrument will be used to conduct surface soil scans. Instrument specific action levels shall be used to determine approximate radiological soil concentrations. Any areas where the count rate is greater than the determined action level shall be considered exclusion zones and marked appropriately.

- Ludlum Model 3 Survey Meter with pancake G-M probe (or equivalent). This instrument will be used to conduct surveillance surveys of both personnel and equipment leaving exclusion zones. The action level for both equipment and personnel surveys is any count rate that exceeds background level. Decontamination procedures detailed in section 9.0 of the HSP will be used when contamination is located.

- Ludlum Model 3 Survey Meter with 1"x1" NaI probe "MicroR meter" (or equivalent) and Eberline Model RO-2 Ion Chamber (or equivalent). These instruments will be used periodically to ensure that dose rates in work areas as well as the Site perimeter are below prescribed levels. The action levels for both on and off site are detailed in Section 7.8 of the HSP in Table 7.1.

43) **Section 7.6, Page 30, Second paragraph**: Frisker is nonspecific. A more specific instrument should be identified.

Revised as follows:

Before leaving the exclusion zone, Site personnel shall be checked through use of a hand-held frisker to ensure that contamination is not present on skin or clothes. The frisker will be a Ludlum Model 3 survey meter with a pancake G-M probe (or equivalent).

44) **Section 7.8.1, Radiological Action Levels. Page 31, First paragraph**: Smearing workers is not an appropriate surveillance method. Trigger levels on specific worker surveillance instruments should be stated. These should include gamma exposure rates.

Revised as follows:

Radiological action levels for on-site workers will be determined by performing surveillance surveys as well as airborne particulate monitoring for the presence of radioactivity.

Table 7.1 has also been revised to address these comments, and is attached to this document.

45) **Table 7-1, Page 33, Item a:** Smear samples are appropriate to objects. It is unclear how an object smear will indicate a need to upgrade respiratory protection.

The radionuclide specific DAC should be written down. Also, there will be a need to translate gross alpha counts to the appropriate level for a single radionuclide concentration.

It would be prudent to institute action levels before the regulatory criteria are reached.

Table 7.1 has been revised to address these comments, and is attached to this document.

46) **Section 8.0, Personal Protective Equipment, Page 35, First set of bullets**: Coveralls should be disposable or washable through a contaminated clothing vendor. Coveralls should be those removed at the boundary of the exclusion zone.

Revised as follows:

- Coveralls, disposable or washable through a contaminated clothing vendor. Coveralls are to be removed at the boundary of the exclusion zone.

47) **Section 9.2, Page 36, First paragraph**: The boundary for removing contaminated clothing should be the exclusion zone, not the site boundary.

Revised as follows:

If levels of radioactivity show that individuals can remove coveralls and other personal protective clothing and equipment before leaving the exclusion zone and, thus complete decontamination, the individuals may leave the exclusion zone.

If you have any questions or comments, please contact us at 847-279-2500.

Regards,

STS CONSULTANTS, LTD.

Julie R. Apolinario
Senior Project Manager

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: Timothy Ramsey, Piper Marbury Rudnick & Wolfe

ATTACHMENTS

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TEACHERS' RETIREMENT - GMO SITE
REMOVAL ACTION WORK PLAN

1.0 SCOPE AND OBJECTIVES

The subject site for this Removal Action Work Plan (the "site" or the "subject site") at 341 East Ohio Street, Chicago, Illinois, is a vacant parcel of approximately 2.16 acres located at the northwest corner of McClurg Court and East Grand Avenue, Chicago, Illinois and is depicted on Figure 1-1. The site is currently a vacant, at-grade paved parking lot; however, the site is not presently being used for parking. Teachers' Retirement System of the State of Illinois ("TRS") previously made a mortgage loan secured by the site and after such mortgage went into default and TRS subsequently acquired the site by deeds in lieu of foreclosure.

The site has historically been used for several different purposes, including buildings used to support supply and wholesale distributors; shipping and receiving operations; an experimental lab, a machine shop, printing and lithography operations and a waxed paper manufacturer. Velsicol Chemical Corporation (Velsicol) used all of the site buildings constructed by the previous occupants as their corporate headquarters and as research and development laboratories for herbicides, insecticides and plant growth regulators from as early as 1917. Foundations and basements from these buildings are expected to be found on the property during the excavation and removal action process.

The site is across the street (north of East Grand Avenue) from the site at 316 East Illinois, Chicago, Illinois which is owned by River East, LLC, and on which radiologically impacted soils were previously detected by the U. S. Environmental Protection Agency ("USEPA"). USEPA determined that the radiologically impacted soil at the 316 East Illinois Street site was associated with the former operations of Lindsay Light Company at 316 East Illinois Street and 161 East Grand Avenue. On June 6, 1996, USEPA issued a unilateral administrative order ("UAO") pursuant to Section 106 of the Comprehensive

Environmental Response, Compensation and Liability Act ("CERCLA") to the Chicago Dock and Canal Trust (now known as River East LLC) and to Kerr-McGee Chemical Company (the corporate successor of Lindsay Light Company and now known as Kerr-McGee Chemical, LLC) requiring River East and Kerr-McGee to perform a removal action with respect to the radiologically impacted soil on the 316 East Illinois Street site (which USEPA designated "Lindsay Light II") and on any areas off the Lindsay Light II site on which such radiologically impacted soils were found. Subsequently, radiological impacts were discovered at the site which was owned by Grand Pier Center, LLC immediately to the west of (and across Columbus Drive from) Lindsay Light II and which was designated by USEPA as "Lindsay Light II/RV3 North Columbus Drive". USEPA determined that the radiological impacts at Lindsay Light II/RV3 North Columbus Drive were associated with the former operations of Lindsay Light Company.

On March 29, 2000, USEPA amended the UAO to require Kerr-McGee, River East and Grand Pier to perform removal action at Lindsay LightII/RV3 North Columbus Drive.

TRS has previously entered into a contract to sell the subject site to a third party purchaser which engaged environmental consultants to perform environmental investigations of the site. B. Koh & Associates, Inc. ("Koh") performed a radiological investigation of the site including surface gamma radiation readings, down-hole radiation readings and soil sampling and analysis. Koh's report dated May 2000 documented its findings of elevated gamma radiation and radiological concentrations at the site. TRS reported the findings in the Koh report to USEPA. On March 1, 2001, USEPA issued an Action Memorandum Amendment setting forth determinations by USEPA that, among other things, (1) the radiological impacts at the site are associated with the former operations of Lindsay Light Company and (2) the UAO requires Kerr-McGee to proceed with a removal action with respect to the radiological impacts at the site. TRS has made demand on Kerr-McGee to perform all removal actions required at the site, but Kerr-McGee has not agreed to perform all such removal actions. In order to provide for the performance of the removal actions,

TRS and Kerr-McGee have agreed that (A) TRS will perform excavation, screening and sampling at the site as described in this Work Plan, (B) Kerr-McGee will transport and dispose of the radiologically impacted soils removed from the site, and (C) each of TRS and Kerr-McGee reserve their rights to, among other things, recover their costs with respect to their respective work activities which they will perform with respect to the site.

This Work Plan:

(a) describes the survey methods which are proposed for identifying the radiologically impacted materials

(b) proposes excavation procedures for eliminating the impacted soils from the site

(c) details the screening methodology

(d) describes the air monitoring and health and safety plan

(e) outlines closure documentation and material disposal.

It is the intent of this Work Plan that the work activities described will be consistent with the National Contingency Plan at 40 CFR Part 300 and that such work activities constitute a time critical removal action under 40 CFR Section 300.415. TRS requests that USEPA confirm that the work provided in this Work Plan constitutes a time-critical removal action consistent with the NCP.

It is the intention of this Work Plan, upon approval by USEPA, to perform the site survey, identify radiologically impacted soil and materials, and remove all radiologically impacted soil and materials above the proposed cleanup threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228). Upon completion of all required excavation and removal of all identified radiologically impacted materials above the proposed cleanup threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228), TRS will request a closure document from USEPA to the effect that (i) all such work has been completed in accordance with this Work Plan, (ii) no further radiological investigation or removal action is required at this site, (iii) there is no evidence

of any radiologically impacted material remaining at the site, and (iv) construction and development work on the site may proceed without further regulatory requirements relating to radiological impacts.

2.0 MANAGEMENT STRATEGY AND KEY PERSONNEL

This section of the work plan describes the management structure that TRS and its consultants will use to accomplish the excavation and removal activities.

2.1 Project Overview

There are three phases of work which comprise this Work Plan. These consist of the Investigation and Delineation Phase, the Initial Contaminant Removal Phase, and the Site-wide Excavation, Monitoring and Removal Phase. The Investigation and Delineation Phase was begun with the survey and sampling work previously completed by Koh and Associates, as reported in their May 2000 report. This phase will continue with the site surveys to be conducted as the asphalt pavement is removed. The Initial Contaminant Removal Phase will consist of the removal of the radiologically impacted zones identified in phase 1. Finally, the Site-wide Excavation, Monitoring and Removal Phase will involve the surveying of all fill soils on site, and the segregation and removal for disposal of all radiologically impacted soils encountered. A more complete description of these activities is presented in Section 3.0, Methodology.

2.2 Project Execution

Project execution consists of the three phases described above in Section 2.1, Project Overview. The following activities will be required by TRS to enable the project to begin.

- Finalize a contract with Kerr-McGee regarding its role to transport and dispose of the excavated materials, or obtain necessary authorizations to move excavated materials to Envirocare of Utah, Inc. for permanent disposal.
- Send bid documents to qualified contractors and contract for the excavation services. Arrange appropriate logistical support services such as fencing and site security, office and equipment trailers.

- Notify and obtain appropriate permits for the implementation. This includes City of Chicago, USEPA and State of Utah authorities.

The following activities must be accomplished to complete the project:

- All identified radiologically impacted material above the proposed cleanup threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228) has been removed from the site.
- TRS has received USEPA verification sign-off that all radiologically impacted materials above such cleanup threshold have been removed from the site.
- Equipment and personnel have been demobilized from the site.
- TRS has submitted the required documentation to USEPA for closure of the site.
- USEPA has responded acknowledging the sufficiency of the removal and documentation, in accordance with the UAO and Amendments.

2.3 Project Management Structure

The management structure under which the project will be accomplished is illustrated in Figure 2-1 of this Work Plan. The Project Team consists of USEPA and its support organizations, TRS and its consultants, the construction teams comprised of TRS' consultants, contractors and subcontractors, and Kerr-McGee and its contractors involved in the transportation and disposal tasks. The TRS Project Team consists of the following members:

- TRS Project Manager, Mr. Tim Ramsey
- STS Project Coordinator, Mr. Richard Berggreen
- Quality Assurance Manager, Mr. Ron Palmieri
- STS Project Manager, Ms. Julie Apolinario
- STS Field Team Leader, Mr. Dumas Guerrier
- Health and Safety Officer, Mr. Glen Huber

- Kerr-McGee, Mr. Mark Krippel
- Health Physicist Supervisor, Mr. Steve Carlson

The duties and responsibilities of these positions and organizations are summarized below.

USEPA will be represented by its On-Scene Coordinators (OSCs), whom we understand will be Mr. Fred Micke and Ms. Verneta Simon. Mr. Larry Jensen, Radiation Health Physicist and other support staff will assist the OSCs. Argonne National Laboratory will provide laboratory subcontract services for radiological analysis of samples from this project.

TRS will be represented by its project manager who will be responsible for communications between TRS and the project team. The TRS project manager will review project documents, plans, and progress reports to confirm the plans and implementation are consistent with TRS objectives.

The Project Team Project Coordinator will have overall responsibility for coordination of project communications and resources. These responsibilities include communications between the project team and USEPA, and among the various members of the project team, including Kerr-McGee, the Health Physics subcontractor, the excavation contractors, and other subcontractors on the project. The position description is included in the QAPP.

The Project Manager will be responsible for day-to-day implementation of this Work Plan. This will include coordination of schedules with the contractors and subcontractors, planning and scheduling activities with the USEPA to provide for verification of remediated locations, and documentation of activities as provided for in this Work Plan.

The Field Team Leader is responsible for coordinating the field activities, in particular coordinating the excavation and health physics technician subcontractors. The Field Team

Leader will be responsible for day-to-day communications with the USEPA's OSC whenever the OSCs are on site.

The Project Quality Assurance Manager will provide guidance on quality assurance/quality control (QA/QC) issues. This includes but is not limited to guidance regarding sampling, data validation and chain of custody procedures. The Quality Assurance Manager will provide the Project Coordinator copies of reports pertaining to QA/QC.

The Quality Assurance Manager functions independently from the personnel directly responsible for accomplishing the excavation and removal. He/she reports to the Project Coordinator and the TRS Project Manager and has access to higher levels of management with whom he/she can consult to resolve quality related project issues.

Kerr-McGee will be responsible for transportation and disposal of the radiologically impacted materials excavated and removed from the site. That responsibility includes health physics personnel to survey the transport containers, subcontractor transportation and logistics personnel, and documentation for shipping and disposal. The disposal is proposed to be under an existing contract with Envirocare of Utah, Inc. In the event Kerr-McGee is unable to fulfill this role, a logistics subcontractor will be available to complete this work. The anticipated scope of this work is presented in Appendix 1 of this Work Plan.

2.4 Delineation and Design

Delineation of the radiologically impacted materials was initiated through an investigation completed by B. Koh and Associates, Inc. as documented in its report dated May 2000, "Summary of Radiological Survey, Time-Life Property, Chicago, Illinois". The delineation will be further developed in the initial stages of removal as the pavement is removed from

the site and the ground is surveyed. This is described below in Section 3.1.3, Site Survey and Section 3.1.5, Excavation Work.

The removal work scope will require sloping of the excavation side slopes up to the property line. The wedge of material remaining unexcavated on-site will be sloped as steeply as can be safely accomplished without endangering the adjacent right-of-way, likely on the order of 1 V:1.5 H. Prior to excavation, this wedge of material will be surveyed for elevated gamma radiation utilizing a series of borings on a 2-meter square grid. The Work Plan detailing the proposed slope survey was submitted to USEPA by STS on July 18, 2001. Pending approval by USEPA, this Work Plan will be utilized to confirm that the slope materials are "clean". Any identified radiologically impacted material will be removed to the property line during the excavation phase of the project.

This design detail and the results of the slope survey will be provided with this as part of any bid package to contractors who might be invited to bid on the proposed excavation and removal work. The design will be submitted for review and will conform to the requirements of the appropriate public agency or governmental oversight unit.

2.5 Construction

Excavation and removal activities will be completed in accordance with the terms of the UAO, the specifications of the Construction Quality Assurance Plan (CQA Plan) and this Work Plan. The CQA Plan is Attachment 1 to this Work Plan.

Excavation will be scheduled so that activities will proceed expeditiously. Activities will normally be scheduled during daylight hours, Monday through Friday. Exceptions to this may be made where, for example, the Field Team Leader determines that extended work hours will allow a work item to be completed or secured before a weekend or before inclement weather. It is proposed to the extent possible to transport containers at night to

avoid traffic congestion. The USEPA will be advised as soon as practical before working during extended hours.

2.6 Maintenance

Following completion of the removal, it is proposed to continue the site security, i.e., fencing the entire perimeter and maintain the site as at the completion of the removal and replacement of the clean excavated spoil. Environmental Remediation Caution signs will be removed from the site perimeter upon receipt of notice from USEPA that all radiologically impacted material has been removed from the site. Any additional work beyond the completion of the removal and replacement of the clean spoil will be in accordance with the construction permit specifications from the City of Chicago.

2.7 Monitoring

Air monitoring will be conducted at two levels. Site perimeter monitoring will be conducted at the four sides of the site (north, south, east, and west). This air monitoring is for the purpose of documenting, and if detected, initiating measures to control off-site airborne contamination. Air monitoring will be conducted in accordance with the Air Monitoring Procedure, SOP 212.

Personal air monitoring will be required for workers in an exclusion zone. Procedures for personal air monitoring are presented in the Health and Safety Plan included in Attachment 3.

2.8 Reporting

Monthly progress reports will be submitted to USEPA beginning 30 days after USEPA's approval of this Work Plan, and will be submitted monthly by the 15th of each month until

termination of the UAO, unless otherwise directed by the OSC. These monthly reports will describe all significant developments during the preceding period, including the work performed, and any problems encountered, analytical data received during the reporting period, and developments anticipated during the next reporting period, including a schedule of work to be performed, anticipated problems, and planned resolutions.

A closure report will be prepared upon completion of the removal of all identified impacted material from the site, and acknowledgement from USEPA that the removal work is complete and the closure report is due. The closure documentation report will provide a summary of the locations remediated, the volumes of all materials removed and their disposal locations, resources allocated and costs for the removal, analytical results, field data documenting the clean closure, and a certification in accordance with the requirements of the UAO. This closure documentation report will be provided within 60 days of the completion of the removal of all identified radiologically-impacted soil.

2.9 Existing Data

The following reports of previous environmental investigations were provided by TRS for the preparation of this Work Plan.

- Letter dated August 22, 1990 from OHM Corporation to GMO Limited Partnership
- Environmental Site Assessment dated August 28, 1990 prepared by Professional Service Industries, Inc.
- Visual Site Inspection dated December 30, 1993 prepared by USEPA, Region V, with attached Preliminary Assessment/Visual Site Inspection Report dated December 16, 1993 prepared by PRC Environmental Management, Inc.
- Preliminary Environmental Review dated March 8, 2000, prepared by GaiaTech, Inc.

- A Phase II Soil and Groundwater Investigation Report Time-Life Property, Grand Avenue and McClurg Court, Chicago, Illinois, dated May 11, 2000, prepared by GaiaTech, Inc.

- Summary of Radiological Survey Time-Life Property, Chicago, Illinois, dated May 2000, prepared by B. Koh & Associates, Inc.

- Scanner Van Survey of the Chicago, Illinois Streeterville Area dated July 12, 2000 prepared by USEPA Radiation and Indoor Environments National Laboratory.

PROJECT MANAGEMENT ORGANIZATION CHART

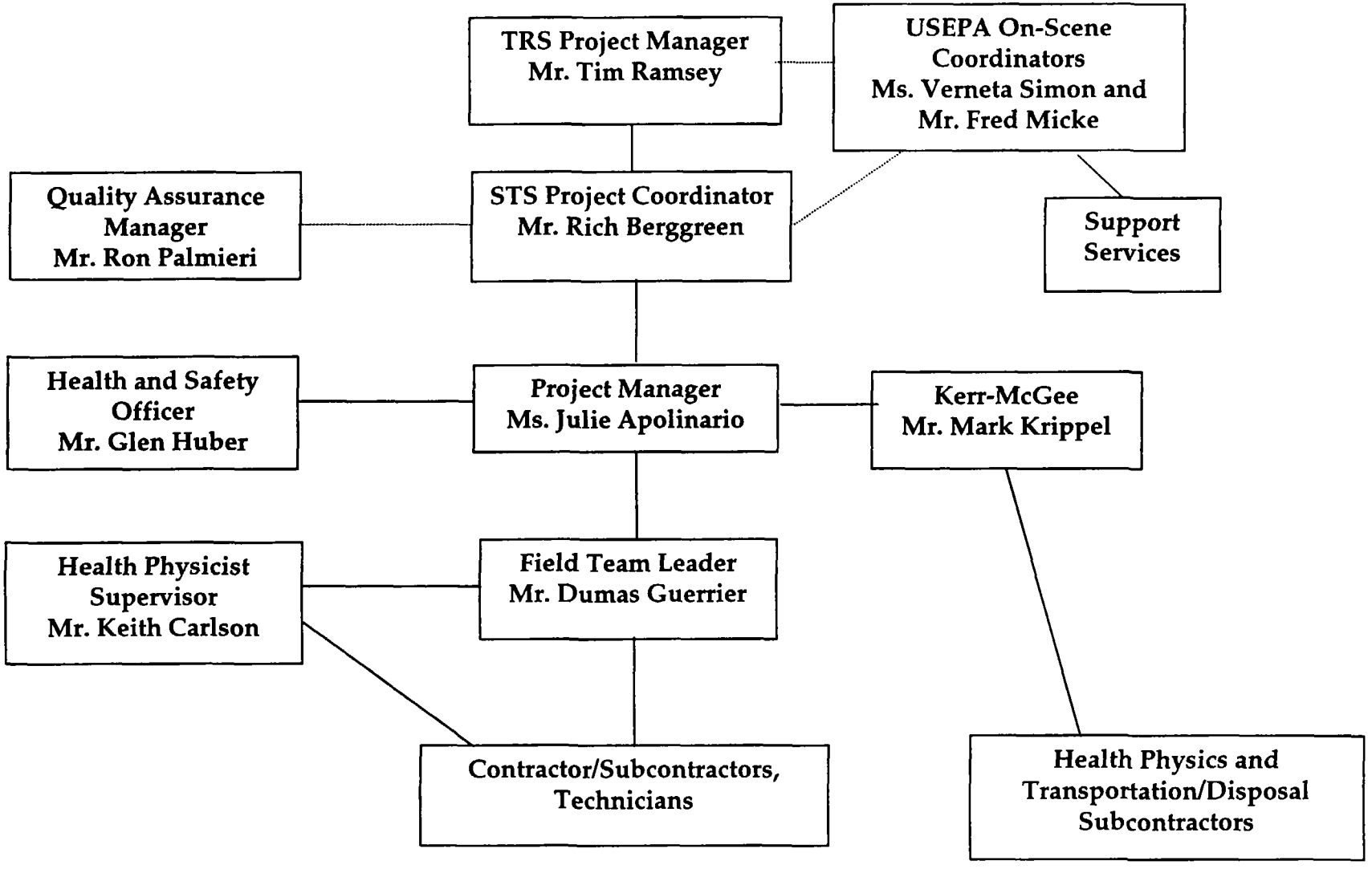


Figure 2-1

3.0 METHODOLOGY

3.1 Description of Work Activities

3.1.1 Site Preparation

The site is currently a vacant, out of service, paved parking lot. There are no structures on the property. A traffic guardrail surrounds most of the site and will require removal. The existing light poles on the site will also require removal. Storm drains are present on-site and will require removal as work proceeds. They will likely be removed as part of excavation rather than in the utility abandonment task. Structures/foundations from Velsicol should be expected. Prior to beginning the removal of the pavement, no other demolition activities are anticipated as part of site preparation.

A 5 meter by 5 meter site grid will be established for the site. Grid lines will be alphabetic from north to south, and numeric from west to east. Site locations will be referenced to this alpha-numeric grid during the remediation and closure documentation.

Other site preparation efforts such as fencing, utility closure, logistical support facilities, and pavement removal in preparation for surveys and removal efforts are discussed below.

3.1.2 Permits

All necessary permits and sign-offs will be secured for the implementation of the site excavation, survey, and remediation work. Permit applications will reflect the exemption available for work on CERCLA-directed project sites. Permits and sign-offs for work at this site may include but are not limited to the following:

- excavation permit;

- Board of Underground review;
- street closure/sidewalk closure permit;
- wrecking permit;
- consultation with the Sewer Department;
- meetings with utilities; and
- consultation with the City of Chicago Department of Environment.

Details of the permit process, the necessary permits, permitting agencies, and utility protection are provided in the Permitting and Access Requirements Plan, Appendix 2.

3.1.3 Site Survey

Prior to any work at the site including demolition or removal of any pavement or features at the site, the following will be documented by the Field Team Leader, his designee, or a licensed surveyor.

- The site grid at 5 meter spacing will be established.
- The site boundaries will be located and marked.
- The location of all surface features such as the guard rail, storm drain catch basins, utility vaults, light standards, etc.
- A photographic record of the site will be made and retained in the project files.

The beginning of the removal work task will be to begin removal of the asphalt pavement cover in stages. Once the asphalt paving is removed from each area of the site, as shown in Figure 3-1, 100% of the soil surface in each such area will be surveyed for elevated gamma readings. This survey work will be part of the Investigation and Delineation Phase that was begun with the Koh investigation as documented in its report dated May 2000. The survey will cover the exposed soil on survey lines spaced 5 meters. Gamma count values

shall be taken at intervals spaced 5 meters (5 x 5 meter grid). The site grid will be marked by stakes and flagging at the edges of the property and by paint on the ground surface on the interior of the site. The areas between the grid points will be scanned following Documents SOP 210 so as to cover the intra-grid areas.

3.1.4 Utilities

For this project, "utilities" include natural gas, water, sewer, communication, cable television lines, and electrical power distribution systems. Prior to the physical site survey, city and utility company records concerning location and construction of utilities on and in the general vicinity will be reviewed and consolidated on a single Utility Plan Drawing. This drawing will be based on City of Chicago maps. The appropriate utility companies or their designees will be asked to verify the location by originating a request through the Chicago Utility Alert Network (DIGGER) phone number: 312-744-7000, and through application to the Chicago Board of Underground.

During the physical site survey, the locations of the identified utilities will be "ground-truthed" by observing the locations of power and phone poles, above-ground transformers (where electrical distribution lines are below ground), manholes, water meters, natural gas meters, phone boxes, surface indications such as utility vaults, catch basins, and surface depressions which can occur over utility trenches, and the locations marked by the utility companies or their representatives.

The locations of these utility indicators will be plotted on the Utility Plan Drawing, and compared with indicated locations. Discrepancies of more than 1 meter (about 3 feet) will be noted. Procedures for working in the vicinity of utilities and repair to damaged utilities will be discussed with the excavation contractor crews. All work on and in the vicinity of utilities will be in accordance with City and utility company specifications.

3.1.5 Excavation Work

Excavation will proceed in two phases, the initial contaminant removal phase and the site-wide excavation, monitoring, and removal phase, with the first phase being completed before beginning the second phase. The initial removal will be of the radiologically-impacted soils identified through the site walk-over gamma survey following removal of the asphalt cover. Those soils will be removed to apparently clean limits, at or below 7.1 pCi/g total radium. Excavation will utilize an excavator with a maximum 1 cubic yard (C.Y.) bucket. This bucket size will facilitate loading the transport containers without spilling and spreading the contamination. The excavations will be designated exclusion zones for purposes of health and safety requirements.

The second phase of excavation will be to excavate and screen all of the fill soil within the site perimeter, and any of the underlying native soils which exhibit levels of radioactivity requiring removal and off-site management. This second phase will involve staging of non-radiologically impacted soil for use as backfill as the excavation progresses. Radiologically-impacted soil will be loaded into Supersacks and temporarily stored on-site until sufficient material is accumulated to warrant bringing a transport container to the site. Arrangements for the use of "Baker Boxes" will be made before construction starts; site mobilization will include provisions for the staging of these boxes as soon as they are needed. Staged material in Supersacks will be maintained in a secure location, on pavement or a membrane and covered to protect from wind and precipitation.

At present it is anticipated that the excavation will progress from the west end toward the east. This progression is anticipated based on the fact that it appears from current information that there is a larger area of impacted soil at the west end of the site. Therefore, this area may already have significant areas excavated and disrupted as a result of the first phase excavation. Excavating and screening the remaining portion of the west end of the site will allow this area to be released, regraded, and used as the temporary staging areas

for non-radiologically impacted overburden and fill from the remainder of the project. Phase 2 material which is below the 7.1 pCi/g cleanup criteria and is used as backfill on-site will be spread, compacted and graded to provide a stable driving surface for staging soil and loading containers. Fill material will not be imported to bring the site back to its original grade.

Excavation will be limited to not more than 18 inches per lift followed by a survey for elevated gamma readings. This restriction is due to the shielding provided by soil which could preclude detecting impacted soil beneath a soil cover of 18 inches or more.

Excavation will proceed through all fill soils within the subject site. The fill soils are underlain by natural soils consisting of medium to coarse sand and fine gravel. This natural soil will be screened to confirm no radiological impacts and will be subject to verification surveys and sampling by USEPA, in accordance with Section 3.1.7 of this Work Plan. Where floor slabs are present at the base of the fill, the slab will be broken and removed and the soil beneath the slab screened for verification and closure by USEPA. Concrete slabs, footings or walls encountered during the excavation will be cleaned of adhering contamination and after release as non-contaminated, will either be removed from the site or stockpiled on-site for subsequent management in connection with site development work. It is not proposed to bury these oversize pieces in the backfill.

In the deepest parts of the excavation, depths of 15 feet or more may be reached. These depths may encounter groundwater at a depth of 13 to 14 feet, based on previous borings. The potential for having to manage groundwater will be addressed through permitting from the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC). Notice to and discharge permits from the MWRDGC and Chicago Department of Sewers will be provided prior to discharge of any water off site. It may be possible to manage the water on-site without the need to discharge to the city sewer system. Available information indicates that only a small part of the site, near the northeast corner, will have an

excavation as deep as 15 to 16 feet. It may be possible to lower the water through excavated sumps, and pump the water to the west end of the site and use it as dust control, or simply let it infiltrate through the site fill soil.

3.1.6 Materials Management

Actions to manage removed material include all actions taken from the time the material is excavated until it reaches its final destination. Materials that are removed from the property may be replaced in their original locations, placed in another location on the property, salvaged, or sent to a local landfill if the materials meet the clean-up criteria. Materials that do not meet the cleanup criteria will be sent to an approved disposal facility. At present, it is anticipated the radiologically-impacted material will be sent to Envirocare of Utah, located in Clive, Utah.

Any trash and debris which TRS elects to remove from the site and which are not radiologically-impacted will typically be placed into clean roll-off containers provided and collected by licensed trash removal and disposal companies. Radiologically impacted materials will be transported between the Site and the approved disposal facility according to DOT regulations. Procedures which will be used with respect to radiologically-impacted materials to minimize the potential for and effects of spills and accidents during transport of such radiologically-impacted materials include but are not limited to the following:

- Drivers will have the proper licenses, training, and certifications for transporting potentially radioactive materials.
- Trucks transporting low-level radioactive materials will have sealed or lined containment. Covers for the roll-off containers will be placed over the load prior to exiting the contaminated area. Covers will be fastened down tightly to prevent materials from being blown out of the containers. This will minimize the escape of materials should an accident occur. Empty containers returning to the site will also have covers. Trucks will carry all necessary papers and placarding. Containers will be inspected prior to loading to determine suitability.

- Contaminated vehicles and equipment will be decontaminated first using broom cleaning to remove all adhering surface dirt. As needed, pressurized water spray will be used for further decontamination. Water generated during decontamination will be contained and evaporated or used for dust control, or possibly for disposal at an approved disposal facility.

- Prior to transporting excavated soils or other materials, all transport equipment will be frisked. Frisking will include tires and fenders and the sides and back of the bed. Frisking the cabs of trucks will not be necessary unless loading has been over the front of the truck.

- Travel between the property and the rail terminal will be only on specified routes selected to minimize the potential for and the effects of any accidents. Criteria used to select routes and Traffic Control procedures are described in Section 3.2 and Appendix 3 of this Work Plan.

- An Emergency Contingency Plan (Appendix 4) has been prepared for this project. This plan includes procedures to be implemented in the case of an accident. All truck drivers will be trained in and familiar with these procedures.

Two types of material will be distinguished in the excavated material:

- Radiologically-impacted soil exceeding the clean-up threshold of 7.1 pCi/g total radium, and

- Non-radiologically impacted soil suitable for backfill.

There may be materials that will be specified by the owner as unsuitable for backfill, based on engineering properties, non-radiologic impacts, or other specifications. For this Work Plan, only the radiological distinction is proposed. Any disposal of non-radiologically impacted materials at any off-site location will comply with all applicable laws and regulations.

Soils which, based on visual or olfactory observations, are suspected to be grossly impacted by non-radiological contamination, will be staged on-site to allow for sampling and waste characterization to provide for disposal permitting. These soils will be placed on liners and will be covered to minimize potential for erosion and spread of the material. To the extent

possible the materials will be staged on pavement to minimize potential to impact underlying soils. The proposed staging area is shown on Figure 3-1.

Radiologically-impacted soil excavated in Phase 1 will be loaded directly into containers. In Phase 2, it is anticipated the excavated quantities of material exceeding the cleanup standard at individual locations will not fill a container. Where that is found to be the case, soil exceeding the cleanup level will be temporarily stored in Supersacks until enough has accumulated to warrant delivery of a container. Where locations are encountered during Phase 2 where significant quantities of material require removal, direct loading of containers will be resumed.

3.1.7 Verification Sampling

Soil exhibiting contamination above the clean-up threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228) will be removed, placed in transport boxes as specified in the S&P documents, and shipped to Envirocare of Utah.

In order to demonstrate that the floors and sides of soil excavations meet cleanup criteria described in the UAO, a verification/field sampling program must be implemented following the excavation of the radiologically-impacted materials. The verification survey and sampling program will be conducted in general accordance with SOP-223.

Initial field demonstration that the location has been excavated to clean limits will be made with a 2 x 2 NaI detector which has been calibrated against the calibration blocks at the Kerr-McGee West Chicago facility. Pre-verification samples will then be collected and analyzed at an on-site laboratory using NUTRANL software and gamma spec analyses. Excavated locations will be screened in accordance with SOP-210.

Detailed descriptions of the verification sampling, analyses, and comparisons which will be done for this sampling are provided in Appendix 5 of this Work Plan. The excavations will not be backfilled until a signed verification closure form is received from USEPA.

3.1.8 Description of Crews and Production Schedules

Construction activities have been identified in the previous sections of this Work Plan. These activities include surveying, radiologically surveying, general excavation, and transportation. Personnel required to complete each of these activities have been grouped into crews, and the crews are described below. Subcontractors may be used for some work, such as fencing, concrete and paving work.

Personnel in addition to those described above will be necessary for this work. These personnel include health and safety personnel, quality inspectors, supervisors, and other management personnel. These personnel are described in the QAPP.

3.1.9 Survey Crew

A physical survey of the site will be developed, including utilities, structures, property limits on both the site and the adjacent rights-of-way. It is anticipated that the survey will be prepared by a licensed land surveyor. Additionally, the Field Team Leader will locate and mark with signs, flagging, stakes, etc. the site 5 meter grids along the margins of the site.

3.1.10 Radiological Survey Crew

The radiological survey crew will be responsible for the initial site survey, surveys as the soil is excavated, surveys prior to the USEPA verification surveys and the surveys of equipment prior to leaving the site. Radiological survey crews will typically be comprised

of two persons, and are required to have a minimum of two persons when working in exclusion zones, in accordance with the Health and Safety Plan.

3.1.11 General Excavation Crew

The general excavation crew will consist of the subcontractor excavation personnel, and is anticipated to include as a minimum, the excavator operator, a laborer, and a truck driver. As excavation proceeds, additional operators, laborers and drivers may be added. As grading of non-radiologically impacted soil proceeds following the removal of the impacted soil, additional personnel will be present on site for that grading work. The size of the crew will depend on the size of the work area and the complexity of the work.

3.1.12 Production and Schedules

Work is proposed to be conducted during the 2001 construction season, and be completed before December 2001. An anticipated construction schedule is included as Figure 3-2.

The following presents the anticipated schedule and sequencing of the excavation and removal project. Note that certain tasks are required prior to the start of the removal effort, but are not detailed in this schedule and sequencing section. These include but may not be limited to the driveway permitting required prior to proceeding, and the logistical support such as site security, mobilization of office trailers, transportation containers, excavating equipment, and training of the contractor and subcontractor personnel.

- The perimeter and site interior guardrail will be removed. This may be done at the same time as the fence is installed and site grid is established and marked. Guard rail posts and footings from below ground will be surveyed for radiological impacts.
- The utilities will be located and as necessary, cut-off and abandoned.

- The existing light poles on the site will be disconnected and removed.

- The asphalt stripping will begin. It is proposed to strip initially only the southwest portion of the site, retaining pavement along the north and east sides of the site. After the removal of radiologically contaminated materials from the southwest portion of the site and the completion of screening of soils in that portion of the site, the remaining portions of the site will be addressed according to the same procedures and in accordance with the sequence depicted on Figure 3-1.

- The asphalt and sub-base will be screened for radiological impacts as they are removed. The underlying soil will be surveyed as the asphalt and sub-base are removed.

- Removal of the identified radiologically-impacted soil will be performed first. The removal will proceed until all initially identified soil has been removed.

- Preparation of the closure documentation report will begin upon removal of all identified radiologically impacted soil. This report will be submitted within 60 days of USEPA notice that all identified radiologically impacted soil has been removed from the site.

3.2 Traffic Control

During the removal project, trucks carrying excavated impacted material will be traveling between the site and the rail terminal. Truck traffic will not be extensive, perhaps 5 to 10 with a maximum of 15 trucks a day, and may be conducted during nighttime hours when local traffic congestion is minimized. Traffic controls will be implemented to minimize the potential for accidents to occur. A summary of the criteria which will be used to select the traffic routes is provided below.

- Routes will be adequate to support the loads. The selected route must be capable of supporting the loaded trucks. Routes with small light bridges and surfaces other than asphalt or concrete in good repair will be avoided wherever possible.

- Ease of travel. The route should minimize the number of stops and turns, and the streets should be sufficiently wide for two trucks to pass where other vehicles are parked on both sides of the street.

- Minimum other traffic. Major traffic routes should be avoided. The more traffic, the greater the potential for an accident to occur. Also, minor traffic routes generally have lower speed limits than major routes. Hours of hauling impacted materials to the rail terminal will be selected to avoid rush-hour traffic.

- Approval of the route. TRS or Kerr-McGee will prepare and submit proposed route maps to the City of Chicago Department of Transportation for approval.

A detailed description of the Traffic Control Plan is provided in Appendix 2 of this Work Plan.

3.3 Site Security Plan

A detailed description of the Site Security Plan is provided in Appendix 6 of this Work Plan. This section provides a summary of the measures which will be taken to minimize the potential for accidents during the work. The work may create several potentially hazardous conditions. These conditions include but are not limited to the following:

- Open excavations
- Moving construction and excavation equipment
- Truck traffic

Only authorized persons will be permitted on-site. Authorized persons include the Project Manager, consultant personnel, contractors, subcontractors, and their representatives. USEPA personnel are authorized to be on-site subject to compliance with OSHA requirements and other reasonable safety precautions.

Visitors and other non-essential personnel may enter the work area only upon notice and authorization by the Project Manager or designee. This restricted access will ensure the Project Manager or designee can communicate to visitors appropriate safety information.

The site will be secured with a construction security fence around its entire perimeter. Gates will be provided at access points but will remain closed and locked when not in use and when there are no removal activities on-site.

Signs will be posted at a maximum 100 foot intervals around the perimeter fence and at each access gate. The signs will read:

"UNDERGOING ENVIRONMENTAL REMOVAL ACTION

FOR FURTHER INFORMATION CONTACT

(CONTACT NAME AND PHONE NUMBER)

Your call will be returned during normal business hours.
Please leave your name and telephone number after the recorded message."

3.4 Health and Safety Plan

This section briefly describes the key personnel responsible for health and safety on the project, the types of hazards which might be encountered during the work to be done, the proposed training, and the personnel protective equipment (PPE) which may be worn for the potentially hazardous conditions which might be encountered.

3.4.1 Key Personnel

While health and safety will be the concern of every person on the job, two persons will have health and safety as their primary concern. These persons are the Health and Safety Officer and the Field Team Leader. The responsibilities for these positions are detailed in the Health and Safety Plan, Attachment 3 to this Work Plan

3.4.2 Potential Hazards

Potential hazards which could be encountered during the removal activities include contaminated materials and the hazards associated with construction work. Contaminants of concern include the entire decay series for U-238 and Th-232. Clean-up criteria are based on total radium, Ra-226 plus Ra-228. Radiologic and air monitoring as described in this Work Plan will be performed during excavation to further define the presence of these contaminants.

The mechanisms for exposure to these materials are direct exposure, inhalation, ingestion and eye/skin contact. The primary mechanism of exposure is direct exposure to external gamma radiation. All workers will be instructed in appropriate measures to protect against exposure to the above materials, and PPE will be worn until monitoring shows such is not necessary.

Physical hazards which might be encountered at this site include but are not limited to the following:

- Construction equipment (front-end loaders, back-hoes, trucks, compactors, bulldozers);
- Power tools (saws, drills, jack hammers, compactors);
- Heat and cold stress;
- Overhead power lines;
- Buried utilities;
- Excavations;
- Confined space

- Noise
- Demolition of structures;
- Slip, trip and fall conditions, especially during wet or freezing periods.

3.4.3 Training

Site and project specific radiation and health and safety training will be provided for all on-site personnel prior to work on site. All personnel required to work in the Contamination Reduction Zone or the Exclusion Zone shall complete training conforming to the requirements of 29 CFR 1910.120(e) including 40 hours of initial hazardous waste site worker training. Where appropriate, they shall have 8 hours of annual refresher training, and 8 hours supervisors training. Field personnel shall complete radiation safety training in compliance with 32 IAC 400. This training shall include, at a minimum, 4 hours of training pertaining to radiation safety and awareness. Training will be conducted by a qualified safety specialist and/or a qualified senior health physics technician, at a minimum. The Project Training Program in included in Appendix 7. As noted in the Health and Safety Plan, Federal safety requirements take precedence over state requirements.

All site personnel will be trained and briefed on radiation basics, anticipated hazards, equipment to be worn, safety practices to be followed, contamination prevention practices, emergency procedures, radiation basics and communications. Procedures for leaving a contaminated area shall be planned and implemented prior to going on-site. Work areas and decontamination procedures will be established based on expected site conditions, and updated as necessary during construction.

In addition to this formal health and safety training, "tailgate" safety meetings will be held weekly, or more frequently, dependent on safety issues arising during the project. These meetings may be led by the worker"s foremen and every employee must sign in before

beginning work for the week. The subject covered and persons present will be recorded for each meeting and kept as part of the project records. Health and safety incidents and monitoring results will be discussed in the tailgate safety meetings, when appropriate.

Visitors to the site will be briefed on the requirements of the Health and Safety Plan before being allowed within the work area, and will be accompanied by a foreman or supervisor whenever possible.

3.4.4 Personnel Protective Equipment (PPE)

Based on information from previous investigations of site conditions, it is anticipated that most excavation work can be done in Level D PPE. Level D PPE for this project consists of hard hat, steel-toed work shoes or boots, work gloves and safety glasses. Coveralls will be required for all work in exclusion zones. Prior to exiting any exclusion zones, personnel will go through decontamination, disposal of all appropriate PPE, and frisking procedures as described in the Health and Safety Plan.

3.4.5 Monitoring

A primary goal during the removal activities will be to control radioactive particulates from the excavation, earth moving, and other activities on-site. A primary requirement of dust control is "no visible dust". Fugitive dust generation is caused by a range of activities including excavation, loading, dumping, transporting and scraping using heavy equipment such as bulldozers, front-end loaders, trucks and graders. Traffic along roadways causes resuspension of particulates.

An Air Monitoring Plan is included as Appendix 8 to this Work Plan. The principal objectives of the air monitoring activities are to:

- Ensure worker and general population safety and provide radiological control information;

- Evaluate work procedures and site control measures. In addition to identifying the need for corrective action, air monitoring also documents the effectiveness of such control actions;

- Measure releases of airborne radioactivity (should any occur) and ensure that people living and working in the surrounding area are not exposed to radiation above acceptable limits.

Air monitoring will be conducted at two levels. Site perimeter monitoring will be conducted at the four sides of the site (north, south, east, and west). This air monitoring is for the purpose of documenting, and if detected, initiating measures to control off-site airborne contamination. Air monitoring will be conducted in accordance with the Air Monitoring Procedure, SOP 212.

Personal air monitoring will be required for workers in an exclusion zone. Procedures for personal air monitoring are presented in the Health and Safety Plan included in Attachment 3.

3.5 Application of ALARA to Excavation

The clean-up criteria established is 5 pCi/g total radium (Ra-226 + Ra-228) above the background. Background for this area has been established on vicinity sites as 2.1 pCi/g, resulting in a clean-up criteria of less than or equal to 7.1 pCi/g total radium. Areas found to contain total radium in excess of the action criterion will be included in the removal activities. Averaging over areas up to 100 square meters is allowed, but only after reasonable efforts have been made to achieve as low as reasonably achievable (ALARA) levels. The principle of keeping ALARA radiation doses consistent with economic and social constraints also applies to the removal activities.

ALARA and the numerical criterion will be met through a coordinated program of surveys and verification conducted by TRS. USEPA will provide oversight role in the application of ALARA to the excavation activities.

3.6 Data Management

Data management for the site, as related to excavation activities, consists of health physics data, soil radioactivity data and civil construction and excavation data (i.e., land surveys, excavation volume estimates, etc.). Given the relatively short anticipated duration of the excavation activities for this project, data can be effectively managed utilizing the paper records required by this Work Plan.

An on-site or site vicinity field laboratory will be used to analyze soil samples as excavation and removal proceeds, and for pre-verification sampling that the clean-up criteria have been met. Analytical records will be kept at the site and at the Vernon Hills, Illinois offices of TRS's contractor, STS Consultants, Ltd. Air monitoring analyses will be maintained at both the site and STS's offices, and will be transmitted with the monthly project progress reports to USEPA.

SECTION 2

SECTION 01020 CONSTRUCTION HEALTH AND SAFETY

Part 1 - General

1.1 Scope

A formal Health and Safety Plan (HASP) has been prepared for the work described in these Specifications. This section of the Specifications summarizes the requirements of the HASP as they apply to the construction work, and references those sections of the HASP where detailed descriptions of the health and safety requirements and procedures can be found.

1.2 Related Work

A. Division 1 Section of these Specifications.

B. Section 02010 - Demolition and Debris Removal

C. Section 02200 - Earthwork

D. Section 02840 - Site Utilities

Part 2 - Products

Not used.

Part 3 - Execution

3.1. Safeguards will be taken to ensure the safety of workers in and around excavations. These will include, but not be limited to, the following:

a. Stairways, ladders, ramps, or other safe means of egress will be located in trench excavations that are 4 feet or more in depth.

b. No persons will be permitted underneath loads handled by lifting or digging equipment. Personnel are required to stand away from any vehicles being loaded or unloaded to avoid being struck by any spillage or falling materials.

c. All trenches and excavations 6 inches or deeper will be marked and guarded for the duration of the project with barricades placed a minimum of 2 feet from the edge of the excavation to prevent persons from falling into the opening.

d. Emergency rescue equipment such as breathing apparatus, a safety harness and line, etc., will be readily available in the project trailer.

e. Precautions will be taken to prevent surface or runoff water from entering the excavation. Ditches, dikes, or other effective means will be installed or used to prevent water from entering the excavation and to drain the surrounding areas.

f. Any excavation that meets the definition of a confined space will be treated as such, as defined by OSHA 1910.146, and all applicable procedures detailed in Section 13 of the HASP will be followed. A crawl space or storm cellar area could fall within the definition of a confined space if it: (1) is large enough and so configured that personnel can bodily enter and perform assigned work; and (2) has limited or restricted means for entry or exit; and (3) is not designed for continuous personnel occupancy.

g. All personnel in an excavation greater than four feet in depth will be protected from cave-ins by an adequate protective system. An adequate protective system will include barrier protection (e.g., shoring or trench boxes) or sloping. Other protective measures required by 29 CFR 1926, Subpart P also will be provided.

h. The determination of the angle of repose and design of any supporting system will be based on careful evaluation of pertinent factors such as depth of cut; possible variation in water content of material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying material, or stored material; and vibration from equipment, blasting, traffic, or other sources.

i. Daily inspections of excavations, the adjacent areas, and protective systems will be made and documented by a competent person. The documentation will include indications of potential cave-ins, failure of protective systems, hazardous atmospheres, or other conditions.

j. No employee or any other person will work adjacent to or enter an excavation until the work area has been inspected by the competent person. The inspection will determine if conditions exist which may expose workers to moving ground or any other unsafe conditions. Any deficiencies identified during inspections will be adequately corrected prior to work in excavation.

3.2. Training

1. All persons active in the excavation work at the Site will receive training as specified in Section 5 of the HASP for work with low-level radioactive materials. The training program in Section 5 of the HASP is in accordance with 29 CFR 1910.

2. In addition to the training above, periodic "tailgate" health and safety meetings will be held. The purpose of these meetings will be to discuss deficiencies in health and safety practices, discuss hazards specific to new properties or encountered at existing properties, discuss the results of monitoring, and generally reinforce good health and safety practices. A typical form for such meetings is found in Section 5 of the HASP.

3. Special training shall be provided or required for work such as the following.

   a. Supervisory Work. All supervisors shall have received at least the additional eight hours training required by OSHA.

   b. Truck Driver. All truck drivers shall be instructed in and knowledgeable about the routes to be used between the property and the train station, the requirements of the work (work with and transport of potentially radioactive materials), and the emergency and contingency procedures to be implemented in the event of an accident.

   c. All persons employed in the transport and handling of radioactive materials shall have received HAZMAT training.

   d. A competent person will be on- site for shoring.

3.3. Personal Protective Equipment (PPE) - Based on information obtained from monitoring observation of similar work at vicinity properties, work at this Site can be done in Level D PPE. The Health and Safety Coordinator will evaluate individual tasks and work areas and specify particular types of PPE based on this evaluation. PPE utilized in the performance of the work under these specifications will be in accordance with Sections 7 and 8 of the HASP.

3.4 Hot Work

A. Flame welding and cutting operations

1. Gas bottles shall be properly color-coded, in good condition, and stored in a secured manner in racks or carts. Bottles with corroded or damaged threads will not be used.

2. Regulators shall be in good condition, and suitable for the use.

3. Fuel gas and oxygen hose shall be easily distinguishable and shall not be interchangeable. Hoses shall be inspected at the beginning of each shift and shall be repaired or replaced if defective.

3.5 Transporting Contaminated Materials Over Uncontaminated Areas

A. Transport between the Site and the Rail Terminal

1. Haul routes between the Site and the rail terminal will be defined (see Traffic Control Plans in Appendix D of the Work Plan), and all operators will be instructed in the location and use of these routes. Transport of contaminated materials will be over designated routes only.

2. Rolloff containers used to transport contaminated materials over uncontaminated areas will be capable of transporting the material without spillage. Covers will be secured onto the containers prior to exiting the contaminated area. Empty trucks returning to the site will be tarped, as will trucks supplying clean backfill, topsoil, and related construction materials. Tarps will be fastened down tightly to prevent material from being blown out of the trucks.

3. Trucks and rolloff containers used to transport contaminated materials will be frisked and decontaminated if necessary in accordance with Subpart 3.8, below, prior to exiting the contaminated area.

4. Should a truck hauling contaminated material from the Site to the rail terminal accidentally spill any part of its load, the Contractor will direct site workers to assist in the cleanup. Spill cleanup, including proper notification of agencies and authorities, will be accomplished in accordance with the Emergency Contingency Plan.

B. Transport within a Property

1. Haulage routes will be established within the Site and all workers will be instructed in the location and use of these routes. Following excavation and restoration of soils and other materials, such routes will be examined, visually and with radiation detection equipment, for the presence of spilled materials. All spilled materials will be removed.

2. Practices to control spillage will be implemented during excavation and restoration. These practices will include such things as the following:

   a. Not filling haul equipment above the sides of the bed or bucket,

   b. Limiting travel speed, and

   c. Covering haul routes with clean soil or other materials. Such materials would be inspected as above, and decontaminated for reuse or properly transported to the rail terminal for eventual transfer to the approved disposal facility.

3.6 Equipment Decontamination Facilities

A. Equipment Decontamination Station - An equipment decontamination station will be readily available for the decontamination of vehicles, tools, and equipment, prior to exiting the controlled area. The equipment decontamination station will be located within the secured area, and will include the following:

1. A steam pressure washer for removing contamination from the wheels, tracks, and other surfaces of the equipment and trucks.

2. An impermeable catchment area for collecting and temporarily storing wash water.

3. A method for removing, and transporting and disposing, if necessary, any wash water.

B. Release of Construction Vehicles and Equipment for Unrestricted Use - Prior to being released from the Exclusion Zone, all construction vehicles and equipment will be frisked, and decontaminated if necessary. Contaminated vehicles and equipment will be decontaminated using a pressurized water spray in accordance with Subpart A, above. Water generated during the

decontamination activities will be evaporated, used for dust control, or collected and stored on the Site for other purposes or eventual disposal.

3.7 Dust and Water Runoff Control

A. Dust control measures used during work activities on the Site may include, but are not limited to the following:

1. Using hoses with mist or fog nozzles to spray light applications of water over the areas of excavation or demolition, staging, loadout, and dumping/storage. The Contractor will be responsible for the control of excess water.

2. Minimizing travel over soil areas. Some travel over contaminated soils (e.g., by excavation equipment and by haul trucks) may be necessary. Dust minimization procedures will include, but not be limited to, the following.

   a. Within the property, the speed limit for trucks and excavation equipment will be fifteen miles per hour.
   b. Areas which will be used extensively as travelways (e.g., entrances to and exits from equipment decontamination facilities) will be sprayed with water as necessary to control dust.

3. Storage and staging piles will be covered when not in use.

B. Runoff water control measures on the Site may include, but are not limited to the following:

1. Excavation of temporary swales, ditches, and/or retention ponds.

2. Construction of temporary diversion dikes and berms.

3. Pumping of water to runoff water control facilities. Water removed from contaminated excavations will be evaporated, used for dust control, or collected and stored on the Site.

3.8 Contingency Plans and Emergency Response Procedures

Contingency plans and emergency response procedures for Site activities are provided in the Emergency and Contingency Plan. These plans and procedures will be followed in the

event of an emergency situation arising from the work activities or acts of God that may affect the environment or human health and safety.

SECTION 3

Section 02200 Contaminated Material Loadout and Earthwork

PART 1 - GENERAL

1.1 Scope

A. General

1. Detailed descriptions of the landscaping, structures, etc. for the Site are included in the Work Plan of which these Specifications are a part.

1.2 Related Work

A. Division 1 Sections of these Specifications

B. Section 02010 - Demolition and Debris Removal

C. Section 02220 - Undermining Existing Features

D. Section 02840 - Site Utilities

E. Section 03300 - Cast-In-Place Concrete

1.3 Site Investigation

A. Investigation Reports

Investigation reports prepared by Koh and Associates (May 2000) are available at the TRS office in Chicago and the USEPA office in Chicago. This report may be used as a guide to conditions on this project as it contains boring summaries and related information depicting surface and subsurface conditions at specific locations at the Site. Surface and soils conditions at other locations may differ from conditions occurring at the boring locations. Therefore, further investigations will be done prior to and during the excavation activities.

B. Contractor's/Subcontractor's Responsibility

The Contractor/Subcontractor shall carefully examine the Site and make all inspections necessary in order to determine the full extent of the work. The Contractor/Subcontractor shall satisfy himself as to the nature, location and conditions of the work, the conformation and condition of the existing ground surface, and the character of equipment and facilities needed prior to and during prosecution of the work. The Contractor/Subcontractor shall satisfy himself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered. Any inaccuracies or discrepancies between the actual field conditions and the Work Plan, or between the Work Plan and Specifications, must be brought to the attention of the STS Project Manager in order to clarify the exact nature of the work to be performed.

1.4 Health and Safety

A. Detailed discussions of the potential hazards and the requirements for minimizing the potential for harm to project and offsite personnel, and to the environment, are provided in Section 01020 and Article 1.5 of this section of these Specifications.

B. All work shall be done under the supervision of personnel experienced and qualified for the work.

C. All work will be done as required by OSHA regulations published in 29 CFR 1910 and 1926. These regulations are included by reference in these Specifications.

D. Sampling of the Site is not complete. Based on preliminary results, sampling and analyses of soils from the Site indicate levels of radioactivity in the soils above background levels. Based on the sampling and surveys, the work can proceed under Level D personal protection conditions. Air and soil monitoring and sampling will be done during the conduct of the work to determine if modifications to Level D work conditions are necessary (see Sections 01020 and 02010 of these Specifications). A complete description of health and safety requirements for this site is provided in the Health and Safety Plan (HASP) for this project.

1. The Contractor shall be prepared to discontinue work in an area and begin work in an alternate area if monitoring and sampling indicate changes in the work conditions may be necessary and if so directed by the Project Manager.

2. The Contractor shall be prepared to begin working under changed conditions (greater than or equal to Level D personal protection with appropriate personal, equipment and vehicle decontamination) with minimal delay. The requirements which may be necessary if asphalt, concrete, wood, metal or other construction materials containing levels of radiation above background are encountered are discussed in Section 02010 of these Specifications.

E. The Field Team Leader or Health and Safety Coordinator may bar any person from the site who, in their opinion, shows a disregard for health and safety requirements.

1.5 Environmental Safeguards and Regulations

A. The Contractor shall comply with all federal, State, and local regulations, and the requirements of these Specifications at all times to prevent pollution of air, water and soil.

B. The Contractor will preserve and protect all structures, equipment, and vegetation (such as trees, shrubs and grass) on or adjacent to the work area, which are not to be removed and which do not unreasonably interfere with the excavation or restoration work. The Contractor will only remove trees when such is required by the Work Plan and will avoid damaging vegetation that will remain in place. Limbs or branches of trees broken by the contractor will be trimmed with a clean cut, and the cut painted with a tree-pruning compound.

C. The Contractor will control air and water pollution as described in these Specifications, the Work Plan, and the QAPP for this project.

1.6 Permits

A. The Contractor shall be responsible for obtaining all permits required for the work and additions described in this section of these Specifications.

B. Copies of all the necessary permits shall be provided to the Quality Assurance Supervisor prior to beginning the work.

C. At a minimum, all work shall be done in accordance with the requirements of the permits. The requirements of these permits are included by reference in these Specifications. Where the requirements of the permits and these Specifications are in conflict, the more stringent requirements shall apply.

1.7 Submittals

A. All submittals shall be made to the Project Manager, with copies submitted to the Field Team Leader.

B. The Contractor shall maintain a log of those submittals directed by the Project Manager (See Section 1340 of these Specifications).

1.8 Definitions

A. Excavation, Excavation is defined as reaching the lines, grades, elevations and contamination depths shown in the Work Plan or determined by in-place monitoring. Excavation of uncontaminated topsoil, silt, clay, sand, gravel, talus, soft or disintegrated rock, boulder or detached pieces of soil rock or debris shall be included, as well as excavation of contaminated material. During the excavation work, monitoring of radiological contamination of the excavated material will be done by STS.

B. Contaminated Soil

1. Soils containing concentrations of Ra-226 plus Ra-228 greater than 7.1 picoCuries per gram (pCi/g).

C. Salvaged Excavation Materials. Uncontaminated soil materials from designated areas of the Site suitable for use as common or structural fill which are not otherwise classified as unsatisfactory (see Part 2 of this Section).

D. Overexcavation. Excavation of any type of material in excess of the lines, grades or depths indicated in the Work Plan or beyond the limits defined by the Work Plan or Specifications.

1.9 Applicable Publications. The publications listed below form a part of these Specifications to the extent referenced. The publications are referred to in the text by the basic designations below.

1. American Society for Testing and Materials standard methods of testing. Hereinafter designated as ASTM. The letters and numbers following ASTM (e.g., D698) refer to a particular test.

2. Standard Specifications for Road and Bridge Construction, Illinois Department of Transportation. Hereinafter referred to as State Specifications.

3. Standard Specifications for Water and Sewer Main Construction in Illinois, Fourth Edition.

4. City of Chicago Zoning Ordinances.

1.10 Quality Assurance

A. By Contractor/Subcontractors

1. All work shall be done under the supervision and control of experienced and qualified personnel, competent in the areas of expertise required for the work described in these Specifications and other documents.

2. The Contractor, at his discretion, may have such tests and inspections as he may desire performed by other qualified personnel or independent testing services, for his guidance and control of the work. The cost for such tests and inspections shall be borne by the Contractor. The Quality Assurance Supervisor will consider the results of such testing in determining whether work has been properly done, but the approval of work shall be made by the Project Manager.

B. Applicable Criteria. Tests and Standards

1. For Excavation of Radioactive Soils. Detailed descriptions of the testing methods and equipment for radioactive soils are described in the Verification Sampling Plan. All soils containing concentrations of Ra-226 plus Ra-228 greater than five pCi/g of dry soil above background, averaged over a six-inch layer, shall be removed.

2. For Disposal of Radioactive Soils. All contaminated soils will be disposed in the manner approved by the USEPA. At present, this is to transport the material to the local rail terminal for shipment and ultimate burial in the Envirocare of Utah landfill in Clive, Utah.

3. For Cleanup. The Contractor shall remove all rubbish, debris, junk, temporary materials, and any surplus excavated materials from the Site, as directed by the STS Project Manager. Excavation and proper disposal of these materials and the restoration of staging and storage areas and temporary roads to the satisfaction of the STS Project Manager shall be a condition for final acceptance.

PART 2 - EXECUTION

2.1 General

A. The work performed under these Specifications shall be constructed to the lines, grades, elevations, slopes and cross-sections indicated in the Work Plan, specified herein, and/or directed by the STS Project Manager. Slopes, graded surfaces, and drainage features shall present a neat uniform appearance upon completion of the work.

B. It shall be the Contractor's responsibility:

1. To maintain adequate safety measures and working conditions.

2. To take all measures necessary during the performance of the work to protect the entire project area and adjacent properties which would be affected by this work from storm damage, flood hazard, caving of trenches and embankments, and sloughing of material, until final acceptance by the STS Project Manager.

3. To maintain completed areas until the entire project area is in satisfactory compliance with the Specifications.

C. Utility lines and structures indicated in the Work Plan which are to remain in service shall be protected by the Contractor from any damage as a result of his operations.

1. Where utility lines or structures not shown in the Work Plan are encountered, the Contractor shall report them to the STS Project Manager before proceeding with the work.

2. Unless their excavation is necessary to allow work to proceed or as a result of contamination, the Contractor shall bear the cost of repair or replacement of any marked utility lines or structures which are broken or damaged by his operations.

3. All repair work, including backfilling, shall be done as required by the governing utility or agency. The Contractor shall contact the governing utility or agency and determine the requirements for properly completing the work. A description of the requirements may be requested to be provided to the Field Team Leader before any work is done.

2.2 Excavation and Restorations. Clearing and Grubbing

A. Clearing Clearing consists of the complete excavation of objectionable materials and obstructions above and below the ground surface, including tree stumps, brush, grass, vegetative matter and other objectionable materials within the project limits. All brush and organic material shall be removed before placing any earth fill unless the earth fill to be placed is topsoil.

B. Grubbing. Grubbing consists of the complete excavation of stumps, including tap roots or lateral roots 1-1/2 inches or more in diameter, and the excavation of brush, grass or weeds to depths below the natural ground as specified herein. Stumps shall be grubbed to a depth of 3 feet and grass or weed shall be grubbed to a depth of 12 inches below the natural ground surface, or to the depths as determined in the field by the Project Manager at the time of construction.

C. Protection. Existing items not designated to be demolished or removed shall be protected from damage. Any such item damaged by the Contractor shall be restored or replaced immediately at the Contractor's expense.

D. Debris and Surplus Material. All debris and surplus material resulting from clearing, and grubbing shall be removed from the site and properly managed by the Contractor. The requirements for managing concrete and asphalt materials are described in Section 02010 of these Specifications.

2.3 Dust Control

The Contractor shall take all steps practical to control dust arising from the construction activity. Detailed discussions of the requirements and potential methods for controlling dust are described in Appendix A of the Work Plan.

2.4 Control of Drainage Water

A. The Contractor shall control drainage water in the area of construction operations, and control storm water and wastewater reaching the construction area from any source, so that no damage will be done to the work or to the environment. The Contractor shall be responsible for any damages to persons or property on or off the construction site due to such drainage water or to the interruption or diversion of such storm water or wastewater on account of his operations.

B. Surface grading shall be done as may be necessary to prevent surface water from flowing into excavations.

1. Any water accumulating therein shall be removed by pumping or by other approved methods.

2. Any water accumulating in a work area which may be contaminated will be tested prior to disposal. If contaminated, such water will be disposed as directed by the Project Manager.

3. Any water which is the result of the Contractor's failure to properly control drainage will be removed and disposed at the Contractor's expense.

2.5 Excavation

A. General

1. The locations of surveyed benchmarks and estimated depths of cut for beginning the work are shown in the Work Plan. The Contractor shall be responsible for providing additional staking and surveying, including both horizontal and vertical controls, to ensure the Work is done to the standards of these Specifications. The Project Manager and Field Team Leader will be available to assist and advise the Contractor.

2. The Contractor shall perform all excavation necessary or required as shown in the Work Plan, or required by these Specifications or the Project Manager. The excavation shall include the disposal or stockpiling of all materials of whatever nature encountered, which shall include both contaminated soil excavation and common soil excavation when both are present, and shall include the furnishing, placing, and maintaining of shoring and bracing necessary to safely support the sides of the excavations.

3. If the horizontal and vertical limits of excavation, as determined by radiological testing, are less than shown in the Work Plan, the Contractor shall excavate only those materials necessary to achieve compliance with the standards of these Specifications.

4. If the horizontal and vertical limits of excavation, as determined by radiological testing are greater than shown in the Work Plan, the Contractor shall extend the limits of excavation as necessary to achieve compliance with the standards of these Specifications.

5. Excavated material shall be placed a sufficient distance from the edge of the excavation to avoid cave-ins or bank slides. In no case shall excavated materials be placed closer than three feet to the edge of the excavation.

6. Shoring and bracing, if necessary, shall be designed by a qualified Professional Engineer competent in soils engineering.

7. The work also shall include all pumping, ditching and other required measures for the removal or exclusion of water.

B. Contaminated Soils

1. Interpretation of the Work Plan

a. The Work Plan indicates the estimated horizontal and vertical extent of a contaminated deposit.

b. Depths of contaminated and uncontaminated soils indicated in the Work Plan represent the total estimated depth from the ground surface to the base of the contamination. The different depths shown across a given deposit are an indication of how the actual contamination depths might be expected to change throughout a given deposit.

c. Information in the Work Plan indicates the existing surface cover material. Unless otherwise indicated in the Work Plan, the replacement surface cover shall match existing.

d. All contaminated materials, including clay, silt, sand, gravel, cobbles and boulders, and rock will be excavated. The Contractor shall be prepared to conduct whatever excavation is necessary to remove contaminated materials.

2. Excavation Procedures

a. If possible, contaminated material shall be removed from outlying areas and boundaries of contaminated areas, working toward the equipment decontamination and loadout facilities, to minimize the potential to contaminate "clean" areas.

b. Truck or container loading shall be done only on ground contaminated and designated for cleanup or on the equipment decontamination pad or other area specially prepared for such work. Care should be taken to avoid spilling during loading.

c. Contaminated (see Subpart 1.8, B, Definitions of this section) and uncontaminated soils shall be separated during excavation and kept separate during loading, transport and stockpiling to minimize the potential for cross-contamination.

d. Excavations shall be performed carefully to minimize the potential for mixing with underlying soils. Also, cleated or crawler-type equipment shall not be allowed without prior approval of the Project Manager.

E Excavations will be radiologically monitored and surveyed by the radiologic technicians to determine if additional material must be removed. Detailed descriptions of the radiological monitoring requirements during excavation are provided in Appendix C (SOPs) of the QAPP.

f. The Contractor shall excavate contaminated and uncontaminated soil to within three inches of the design or estimated depth. From this point, excavation should proceed in no greater than six-inch lifts to the depths indicated in the Work Plan. After excavation of each lift, the Project Manager will radiologically monitor the excavation and delineate additional excavation required (see the Field Sampling Plan).

g. Exceptions to these requirements must be approved in writing by the Project Manager and provided to the Field Team Leader. The Contractor will not be paid for removing extra quantities resulting from a deviation from the above requirements, unless a specific deviation has received prior written approval.

D. Other

Uncontaminated material, including clay, silt, sand, gravel, cobbles and boulders and rock, may need to be removed for slopes on excavations, to expose contaminated soils, structures or facilities, or to facilitate work to remove contaminated soils, structures or facilities. Common materials removed from such areas may be used for backfill if they meet the requirements for fill material. If unsuitable, they shall be removed, transported and disposed as surplus excavation.

2.6 Contaminated Material Loadout and Transport

A. General Requirements

1. Before beginning contaminated material loadout operations, the Contractor shall construct temporary site drainage facilities and initiate dust control measures. The Contractor also shall construct all decontamination and loadout facilities and establish survey controls.

2. The Contractor shall use equipment and methods that minimize the potential for spillage of materials during loading operations.

3. At a minimum, the truck loadout shall be cleaned (liquid and nonliquid wastes removed) at the end of every day. Spilled materials shall be promptly removed from the loading facility if the quantity is such that the material will be picked up and transported out of the loadout facility (e.g., dirt clods which could stick to tires).

4. All decontamination of equipment shall be done as required by Section 01020 and this section of these Specifications.

B. Loadout

1. All debris, such as concrete, asphalt, etc., shall be managed as described in Section 02010 of these Specifications.

2. All loadout of material will be done as required by these Specifications and the Work Plan prepared by the Contractor. Loading of trucks and other containers shall be done only in the loadout or equipment decontamination facilities.

3. Portable scales will be present at the loadout and equipment decontamination facilities for use where loadout is occurring.

4. Unless staging areas have been selected by the Contractor and approved by the Project Manager, soils and debris will be loaded directly into trucks or containers as they are excavated, for transport to the rail terminal. If insufficient quantities of impacted material are encountered, material may be temporarily stored in Supersacks until sufficient material is accumulated to fill a container. Materials will be placed so they do not extend above the sides of the truck bed or container. Materials protruding above the sides of the truck or

container will be pushed down or removed for placement into another truck or container by loading equipment or personnel.

5. Truck beds and containers will be tightly covered with tarps.

6. Truck drivers will generally not enter the Contamination Reduction Zone, but shall remain inside the truck when such entry is required.

C. Decontamination

1. After a truck or container has been loaded and tarped, it will be checked for contamination. The truck tires, body and outside of the bed and the outside of the container will be frisked to determine if contaminated soils are present. If frisking does not detect any contamination, the equipment may be released for travel.

2. If frisking does detect contamination the truck or container will be decontaminated by wiping or spraying.

3. Following decontamination, all trucks and containers shall be frisked for release. If any radioactivity above release levels (see Table 02200-1 at the end of this section) is found, decontamination of those areas will be continued. If spraying or wiping is ineffective in removing contamination, brushes or other means shall be used until release levels are achieved. In no case shall a truck or container with radioactivity above the release levels be allowed to leave the site.

4. After containers are loaded and frisked for release, they shall be staged in a clean area on the site. The trucks used to transport the containers to the rail yard will not need to be frisked prior to leaving the site, as long as the transport trucks do not enter the Contaminant Reduction Zone.

D. Transport

1. Trucks shall use only the designated route(s) to transport containers with contaminated materials from the Site to the rail terminal, and shall obey all signs, speed limits and other traffic laws. Any driver not obeying traffic laws, or the requirements of these Specifications, shall be removed from the work.

2. All trucks shall properly display a decal with all information required for transport of contaminated materials.

3. Each truck shall carry the standard industry bill of lading for each shipment.

4. All truck drivers shall have the training required by 29 CFR 1910.120 and shall be trained in the procedures to be used in the event of an emergency (see Section 01020, Articles 3.2 and 3.7, of these Specifications, and the Emergency Contingency Plan).

2.7 Fill

A. General

Backfill will be placed as uncontrolled fill consisting of excavated material from the Site which is below the 7.1 pCi/g cleanup criteria. No compaction specification is proposed for placement of this fill.

B. Placing and Spreading Fill Material

1. The Contractor shall not commence backfilling until a radiological survey of the excavation has been completed which verifies all contaminated materials have been removed as required by these Specifications, and the Field Team Leader has provided the Contractor with verbal authorization to begin backfilling.

2. Salvaged soil materials shall be used for backfilling unless determined unsuitable by the Project Manager.

3. Unless otherwise shown in the Work Plan, the contractor shall maintain a minimum of 10 feet of separation between excavation of contaminated soils and placement of clean fill.

4. Fill on City of Chicago street rights-of-way shall be done as required by City of Chicago Standard Specifications.

C. The Contractor shall provide and maintain adequate erosion and drainage control facilities during the construction of the fill areas. The erosion control facilities shall be maintained in optimum condition until the work is complete. The facilities shall be inspected following significant rainfall, repairs made and excess sediment removed. It shall be the contractor's responsibility to prevent the discharge of sediment offsite or to adjacent water courses.

D. Backfill around Utilities. In any case where utilities are disturbed or exposed, all repair work shall be done in accordance with the requirements of the utility, or the governing agency (see Specification 02840 Site Utilities).

2.8 Storage (Stockpiling)

A. On the Site

1. Non-radioactive materials, including fill, may be temporarily stockpiled on the Site in the locations noted in the Contractor's approved Work Plan, or as approved or directed by the Project Manager.

a. As necessary, staged non-radioactive materials shall be covered or otherwise managed to control dust.

2. Radioactive materials may be staged (temporarily stored) on the Site in locations noted in the Contractor's approved Work Plan.

a. If not in the approved Work Plan, radioactive materials may be staged on the Site only with written approval from the Project Manager. These materials shall only be stored in Supersacks on contaminated or specially prepared areas to minimize the potential for contamination of "clean" areas.

b. Except when work is actively in progress, the staged materials shall be completely covered with impermeable plastic sheeting or other approved covers.

2.9 Disposal

A. At a minimum, all materials shall be disposed as required by the permits, these Specifications, and the laws, rules and regulations of the USEPA, State of Illinois, and the State of Utah. All materials disposed off the Site shall be surveyed as required by Section 01020 of these Specifications to determine they are suitable for the intended disposal.

B. If the materials are disposed by landfilling or by recycling, the Contractor shall provide the Project Manager with the name of the landfill or recycler.

1. The landfill and recycler must be qualified to receive the waste. Qualification information must be provided for the landfill or recycler, by the Contractor.

2. The Project Manager has the right to reject any landfill or recycler which does not meet qualification standards.

2.10 Surveying

A. A baseline will be established for the Site. This baseline will be tied to the previous U.S. EPA survey done for the property.

B. Items including, but not limited to, the following will be located or identified in relation to the baseline.

1. Visible property boundaries.

2. Landscaping.

3. Facilities.

4. Structures.

5. Utilities.

6. Limits of radioactive contamination. Using the results of previous investigations and the baseline, sufficient stakes or markers will be placed to visibly mark the limits so any contaminated soil can be properly removed.

C. The baseline, as above, and the previous surveys also will be used to locate grids for verification surveying. The size of the grids will depend on the location and the extent of contamination.

D. The work for locating items such as the above can be done with equipment and materials such as the following:

1. Theodolite.

2. Compass.

3. Cloth or steel measuring tape.

2.11 Cleanup

Upon completion of work in this section, all rubbish, debris and unsuitable fill as designated by the STS Project Manager shall be removed from the job site. All construction equipment and implements of service shall be removed and the entire area involved shall be left in a neat, clean and acceptable condition. Proper cleanup of the properties shall be a condition of acceptance of the work and final payment.

TABLE 02200-1
RELEASE CRITERIA

From U.S. NRC, Regulatory Guide 1.86, Table 1

Nuclide[a]	Average [b,c]	Maximum [b,d]	Removable [b,e]
U_{nat}, U_{235}, U_{238}, and associated decay products	5,000 dpm α per 100 cm^2	15,000 dpm αper 100 cm^2	1,000 dpm αper 100 cm^2
Transuranics, Ra_{226}, Ra_{228}, Th_{230}, Th_{228}, Th_{230}, Pa_{231}, Ac_{227}, 1_{125} and 1_{129}	100 dpm per 100 cm^2	300 dpm per 100 cm^2	20 dpm per 100 cm^2
Th_{nat}, Th_{232}, Sr_{90}, Ra_{223}, Ra_{224}, U_{232}, 1_{126} 1_{131}, and 1_{133}	1,000 dpm per 100 cm^2	3,000 dpm per 100 cm^2	200 dpm per 100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr_{90} and others noted above.	5,000 dpm β-γ per 100 cm^2	15,000 dpm β-γ per 100 cm^2	1,000 dpm β-γ per 100 cm^2

a Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

b As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

c Measurements of average contaminant should not be averaged over more than one square meter. For objects of less surface area, the average should be derived for each such object.

d The maximum contamination level applies to an area of not more than 100 cm^2.

e The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

SECTION 4

SECTION 02840

SITE UTILITIES

1.0 GENERAL

1.1 Scope

A. This section describes the general requirements for locating, protecting, removing and installing site utilities.

B. The known locations of utilities will be shown in the Work Order.

1. Excavation to or below the locations of known utilities is expected as part of the work for the Site.

2. Utility lines and structures indicated in the Work Plan which are to remain in service shall be protected by the Contractor from any damage as a result of his operations.

3. All repair work, including backfilling, shall be done as required by the governing utility or agency. The Contractor shall contact the governing utility or agency and determine the requirements for properly completing the work.

1.2 Related Work

A. Division 1 Sections of these Specifications

B. Section 02010 - Demolition and Debris Removal

C. Section 02200 - Contaminated Material Loadout and Earthwork

D. Section 02220 - Undermining Existing Features

1.3 Health and Safety

A. Detailed discussions of the potential hazards and the requirements for minimizing the potential for harm to project and offsite personnel, and to the environment, are provided in Section 01020 of these Specifications and the HASP.

B. All work shall be done under the supervision of personnel experienced and qualified for the work.

C. All work will be done as required by OSHA regulations published in 29 CFR 1910 and 1926. These regulations are included by reference in these Specifications.

D. Sampling and analyses of soils from the Site indicate levels of radioactivity in the soils above background levels. Based on the sampling and surveys, the work can proceed under Level D personal protection conditions (see HASP). Air and soil monitoring and sampling will be done during the work to determine if modifications to Level D work conditions are necessary (see Section 01020). Complete descriptions of health and safety requirements for this Site are provided in Section 01020 of these Specifications and the HASP.

1. The Contractor shall be prepared to discontinue work in an area and begin work in an alternate area if monitoring and sampling indicate changes in the work conditions may be necessary and if so directed by STS Consultants, Ltd. (STS), on behalf of TRS or their Agent.

2. The Contractor shall be prepared to begin working under changed conditions (greater than or equal to Level D personal protection with appropriate personal equipment and vehicle decontamination) with minimal delay. The requirements which may be necessary if asphalt, concrete, wood, metal or other construction materials containing hazardous materials or levels of radiation above background are encountered are discussed in Section 01020 of these Specifications.

E. The Field Team Leader or Health and Safety Coordinator may bar any person from the Site who, in their opinion, shows a disregard for health and safety requirements.

1.4 Environmental Safeguards and Regulations

The Contractor shall comply with all federal, state, and local regulations, and the requirements of these Specifications at all times to prevent pollution of air, water and soil. Detailed requirements for the protection of the environment are provided in Section 01020 and the HASP.

1.5 Permits

A. The Contractor shall be responsible for obtaining all permits required for the work and additions described in this section of these Specifications.

B. Copies of all the necessary permits shall be provided to STS or their Agent and to the Project Manager prior to beginning the work.

C. At a minimum, all work shall be done in accordance with the requirements of the permits. The requirements of these permits are included by reference in these Specifications. Where the requirements of the permits and these Specifications are in conflict, the more stringent requirements shall apply.

1.6 Quality Assurance

A. STS will provide soil testing services. STS will take soil samples and perform moisture-density, gradation, and other tests to ascertain the completed work is in compliance with these Specifications. Samples of the soil may be taken at the place of excavation, stockpiles, or from the fill itself. The testing consultant shall conduct density and other tests on the fill as required by

these Specifications. The Contractor shall render assistance as necessary to enable sampling and testing.

B. The Field Team Leader shall be a person qualified and experienced in the work described in these Specifications.

C. All work shall be done according to the requirements of these Specifications.

1.7 Submittals.

All submittals shall be made to the STS or their Agent.

2.0 PRODUCTS

2.1 Backfill Materials

A. General. Fill materials shall be obtained from suitable stockpiles or borrow as defined in these Specifications. Materials containing organic (except topsoil), perishable, spongy, frozen, expansive or other deleterious materials shall not be acceptable.

B. Embedment. Embedment material shall be fine aggregate or sand as defined by Part 2 of Section 02200 of these Specifications.

2.2 Utilities

Materials used to reconstruct utilities shall be as required by the utility company, the governing municipal agency, or the building code.

3.0 EXECUTION

3.1 Location

A. The known locations of utilities shall be included in the Work Plan for the Site. The Contractor shall be responsible for field verifying utility locations and for obtaining any necessary additional information to properly prepare the Work Plan.

1. Known and suspected utilities are shown in the Work Order. The locations a shown may prove to be inaccurate and other obstructions not shown may be encountered. Any reliance on this information will be at the Contractor's risk. The Contractor shall arrange to have all utilities located by the utility companies or a utility location service prior to beginning work (e.g., DIGGER).

2. Excavations in the areas of suspected underground utilities shall be done with care, using equipment such as small, rubber-tired backhoe/loaders. When within one foot of the expected vertical and horizontal location of the utility, excavation will be done manually until the exact location of the utility is determined.

B. Utility lines and structures which are to remain in service shall be protected by the Contractor from any damage as a result of his operations.

1. Where utility lines or structures not shown in the Work Plan are encountered, the Contractor shall report them to STS or their Agent before proceeding with the work.

2. Unless their excavation is necessary to allow work to proceed or as a result of contamination, the Contractor shall bear the cost of repair or replacement of any marked utility lines or structures which are broken or damaged by his operations.

3. All repair work, including backfilling, shall be done as required by the governing utility or agency. The Contractor shall contact the governing utility or agency and determine the requirements for properly completing the work.

3.2 Existing Utilities Designated for Excavation

A. Overhead Utilities shall be removed and replaced by the utility if such is necessary for proper completion of the work. If the utility will or cannot remove them, procedures for excavation will be discussed with and approved by the utility. At a minimum, removal of overhead utilities shall include the following.

1. Obtain the necessary disconnects and verify the utilities are de-energized and grounded prior to the work.

2. Remove cables and guy-wires from the utility poles.

3. Determine if the above- and below-grade sections of the poles are contaminated with radiological materials.

   a. If the above-grade sections are not contaminated and the lower section is, or if the potential for contamination of the below-grade section is unknown, fell above-grade sections of utility poles by sawing or other suitable methods to separate the uncontaminated above-grade sections from the potentially contaminated below-ground section.

   b. If both sections are contaminated, the pole may be removed by felling the above-grade part and excavating the below-grade part, or by pulling the pole from the ground with a crane or other equipment.

4. Uncontaminated components of overhead utilities, such as cables, guy-wires, etc., shall be disposed as required by Section 02010 of these Specifications.

5. Contaminated components of overhead utilities shall be removed and processed for loadout and disposal as other contaminated debris (see Section 02010 of these Specifications).

6. Excavated materials shall be handled as required by Subparts 3.5, 3.6, 3.8 and 3.9 of Section 02010 of these Specifications.

B. Underground Utilities

1. Underground Utilities to be removed may be removed by the utility. At a minimum, the following procedures shall be used.

a. Obtain the necessary disconnects or shutoffs prior to the work and verify the utility is de-energized, drained, or purged as necessary (lock-out and tag-out procedures properly implemented).

b. Excavate and manage materials to access contaminated utilities or bedding materials as required in Subparts 3.5, 3.6, 3.8 and 3.9 of Section 02010 of these Specifications.

c. Remove, decontaminate and dispose of contaminated utility materials as required in subparts 3.5, 3.6, 3.8 and 3.9 of Section 02010 of these Specifications.

d. Replace, repair, or abandon the removed utility as directed by these Specifications and the Work Order, or the utility company or municipal agency having jurisdiction.

(1) Replacement or repairs of the utilities shall be in accordance with the requirements of these Specifications or the utility or agency.

(2) Abandoned utilities shall be capped as required by Article 3.3 of this section.

3.3 Underground Utilities Encountered During Excavation

A. Damage to utilities shall be repaired under the supervision of the respective utility service or municipal agency having jurisdiction.

B. Abandoned utilities shall be cleaned of all encrusted contamination. Open ends or broken pipes shall be properly capped.

1. At a minimum, capping may be done by crimping, pouring concrete around, or plugging the open end in such a way as to prevent a "least path of resistance" for any future gas leaks.

2. Capping will be done as required by the utility or municipal agency if their requirements exceed those above.

C. Active utilities shall be supported in-place, if suitable, or removed and replaced as necessary to excavate to the depths shown in the Work Order.

1. Support or removal and replacement shall comply with the more stringent requirements of the affected utility or municipal agency or these Specifications (see this section and Section 02220 of these Specifications).

2. Utility lines, whether removed or left in-place, shall be cleaned of encrusted contamination as required and described by Section 02010 of these Specifications.

3. Removed utilities shall be managed and disposed as required in Section 02010 for other demolition debris.

3.4 Underground Utility Installations

A. The Contractor shall coordinate interruptions of utility services through STS or their Agent.

B. If utilities are installed after backfilling is complete, all excavations shall be by open cut.

1. The banks of the trenches should be as vertical as possible. Shoring and bracing, as necessary shall be designed by a qualified Professional Engineer competent in soils engineering. The design of shoring and bracing shall be provided to STS or their Agent.

2. If rock is encountered, the base of the trench will be overexcavated at least six inches to allow for placement of bedding material.

C. If utilities are installed before backfilling is completed to final line, elevation and grade, the fill shall be to at least 12 inches above the top of the utility before excavation and placement of the utility is begun.

D. Trench Preparation. The bottom of the trench shall be accurately excavated to line, and graded and shaped to fit the lower one-quarter of the pipe to provide uniform bearing and support for each section; wedging and blocking will not be permitted. If the pipe has bell ends, the trench shall be overexcavated at the joints. If the common fill is granular, the base of the trench shall be scarified to a depth of six inches and recompacted to at least 95% of maximum density of optimum moisture (standard

proctor, ASTM D698). If the common backfill is not granular in nature, the base of the trench shall be overexcavated six inches and backfilled with granular (embedment) material compacted to at least 95% of maximum density at t2% of optimum moisture.

E. Utility Embedment. All utility lines except electric lines and irrigation lines two inches or less in diameter shall be embedded in fine aggregate (see Subpart 2.1.13 of this section).

1. Embedment material shall extend a distance equivalent to the utility diameter above, below and to the sides of the utility for utilities greater than six inches in diameter. A six-inch embedment shall be provided for utilities less than or equal to six inches in diameter.

2. Care shall be taken not to disturb either the horizontal or vertical alignment of the utility; embed both sides of the utility simultaneously. If necessary, compact embedment material by hand to avoid displacement and damage to the utility.

F. All utility installations shall be inspected by STS, and by the utility or municipal agency if necessary, at the following times.

1. Before placing embedment material over the utility.

2. Before placing common fill over the embedment material.

G. Compaction of common material over the utility shall be by manually-operated power equipment or by hand until at least 12 inches of fill has been placed over the utility. Damage to the utility by compaction or other causes after proper installation shall be the responsibility of the Contractor.

H. Tests. Testing shall be done on all repaired or replaced systems. Testing may be done by the utility or municipal agency or Contractor. All testing will be done as required by the utility, municipal agency or applicable building code. All testing will be done in the presence of STS, and utility, municipal agency or building inspectors, as necessary.

AIR MONITORING PROCEDURE

1.0 INTRODUCTION

The Air Monitoring Procedure provides for measuring the concentration of radioactive airborne dust that could be generated and emitted into the atmosphere as a result of the excavation, moving, and loading activities planned at the Site. The objectives of data collection for air monitoring activities are as follows:

- Collect airborne radioactivity data for the purpose of determining the exposure of workers participating in Site activities to airborne particulates.
- Collect airborne radioactivity data to measure releases of airborne radioactivity to the environment and ensure that people living and working in the surrounding areas of the Site are not exposed to radiation above acceptable limits.
- Collect airborne radioactivity data to evaluate work procedures and Site control measures for the purpose of keeping exposures to both workers and the general public as low as reasonably achievable (ALARA).

2.0 REGULATORY REQUIREMENTS AND ADMINISTRATIVE LIMITS

32 IAC 340.320 states that a licensee must demonstrate compliance with the dose limits for individual members of the public. The Site Air Monitoring Plan is based on being able to demonstrate that the average concentrations of radioactive materials in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the limits specified in Table 2 of Appendix B to 10 CFR 20. The radionuclides in the thorium and uranium series that could potentially be encountered during Site activities are listed in Table 1 of the Air Monitoring Plan. Th-232 has the most restrictive concentrations for both the Derived Air Concentration (DAC) and Air Effluent Limits.

Th-232 Class W DAC=5×10^{-13} µCi/ml Air Effluent=4×10^{-15} µCi/ml

Both worker exposure to airborne particulates and effluent release limits will be based on Th-232.

3.0 AIR MONITORING EQUIPMENT AND MATERIALS

- Staplex Model TFIA High Volume Air Samplers (or equivalent)
- Gilan Model BDXII Low Volume Personal Air Sampler (or equivalent)
- Staplex Model TFA810 "Ashless" Filter Papers – 95% collection efficiency of 1-micron particles. Effective efficiency of 70% (penetration absorption 30%)
- Zefon Model 739 MCE Filter Cartridges – 37mm x 0.8um membrane filters
- Ludlum Model 2200 Scaler w/ Model 43-10 alpha scintillation detector
- Radiological Air Sample Data Form – Area Monitors, Form SOP 212-10
- Radiological Air Sample Data Form – Personal Air Monitors, Form SOP 212-11

4.0 SITE AIR MONITORING PROCEDURE

4.1 Background Air Quality

One downwind, high volume air sample shall be collected for a minimum of eight hours prior to the commencement of excavation activities. This sample shall be analyzed the day after collection and then again after four days to allow for the decay of short lived radon and thoron daughters. The count, after four days decay, will serve as the official measurement of the background airborne alpha concentration. Future results during Site operations should be compared to this value to see if further engineering controls or procedural changes are warranted.

4.2 Perimeter Air Monitoring – High Volume Samplers

Four air monitoring locations shall be used during all excavation activities. Samples shall be collected during all operations where potentially contaminated soils are being excavated, moved, or loaded. One monitor shall be placed on each perimeter of the site (North, South, East, and West) and collect samples at a height between one and two meters above the ground. Flow rate through air samples shall remain between 20 and 60 cubic feet per

minute. Air sample filters shall be collected and replaced daily and submitted to the laboratory for analysis. Samples analyzed from the perimeter high volume monitors shall be used to determine the amount of airborne radionuclides leaving the Site.

4.3 Personal Air Monitoring – Lapel Samplers (Low Volume)

All workers participating in Site activities that involve the excavation, movement, or loading of potentially contaminated soils within a radiological exclusion zone shall wear a Personal Air Monitor (PAM) to evaluate the air quality in the worker's breathing zone. The Health and Safety Coordinator may require that additional personnel wear PAMs if there is a potential for that worker to encounter airborne particulates during Site operations. Samples shall be collected the entire time a worker is inside the exclusion zone and the cumulative time recorded. Flow rate through air samples shall remain between 2 and 4 liters per minute. Air sample filters shall be collected and replaced daily and submitted to the laboratory for analysis. Samples analyzed from the PAMs shall be used to determine potential contributions to worker's dose from airborne radionuclides.

5.0 AIR SAMPLE ANALYSIS

5.1 High Volume Sample Analysis

A 1.75 inch diameter cutout shall be obtained from each 8"x10" high volume sample collected. All data pertaining to the sample shall be included on the *Radiological Air Sample Data Form – Area Monitors* worksheet. This worksheet contains the calculations required to determine total sample volume and sample concentration.

Each sample shall be analyzed the day after collection for gross alpha concentration. The minimum counting time is 30 minutes for Th-Alpha. The "day after" count will serve as a comparison to identify high gross counts from the previous day. It is expected that naturally occurring radon and thorium daughters will interfere with analysis, so the sample must be reanalyzed in four days. Thoron (Rn-220), if present in significant amounts, will

require up to four days to allow for the decay of its Pb-212 daughter (10.6 hour half life). The count, after four days decay, will serve to be the official measurement of Th-Alpha.

Th-232 is the most restrictive of the applicable radionuclides that may be present during Site operations. The Th-232 contribution will account for 20% of the total alpha activity, so each gross alpha count must be divided by five to determine Th-232 concentration.

Multiple concentration measurements improve both precision and detection capability. Although air samples shall be counted the following day (and again four days later), effluent releases shall be reported on a weekly basis using the following calculation:

Equation A.9 NUREG 1400

$$C_{avg} = \frac{\Sigma T_{s,i} C_i}{\Sigma T_s}$$

where C = effluent concentration in µCi/ml

T_s = duration of sample collection

Sample concentration shall be determined using the following calculation:

Equation 6.9 *NUREG 1400*

$$C = \frac{R_n}{E\ F\ K \sqrt{T_s cf\ (5)}}$$

Where: $\frac{N_g}{T_g} \quad \frac{N_b}{T_b}$ –

R_n = net count rate; $R_n = R_g - R_b =$

E = fractional filter efficiency

F = air flow rate through the air sampler, cm^3/min

Cubic feet per hour x 28.316 liters/cfh x 1000 ml/ liter

K = Counting efficiency in cpm/ µCi

T_s = duration of sample collection

Cf = collection vs. analyzed ratio: conversion factor = 0.035

" note: cf is not part of original NUREG calculation. It has been added to account for the fact that we are only analyzing 3.5% of total sample

5 = Samples are analyzed for gross alpha activity. Gross alpha concentration is to be divided by five to determine Th-232 concentration

5.2 Personal Air Monitor Sample Analysis

Personal Air Monitor (PAM) samples shall be analyzed in the same manner as the high volume perimeters samples. The only exceptions are that samples may be collected over the course of one week and that calculations are performed on a different worksheet – *Radiological Air Sample Data Form – PAM's, Form SOP 212-11.*

The action level for airborne radioactivity shall be 30% of the Derived Air Concentration (DAC) for Th-232 (DAC=$5x10^{-13}$ µCi/ml). When PAM analysis indicates that concentrations have reached 1.5 x 10^{-13} µCi/ml, Level C protection may be considered. It is not anticipated that airborne concentrations will reach this level. Engineering controls, such as wetting of soils, and procedural changes shall be implemented to keep airborne concentrations ALARA.

At the conclusion of the project, data obtained from PAM's shall be used to determine a dose from airborne radionuclides for each monitored worker.

6.0 INVESTIGATIONS AND CORRECTIVE ACTIONS

The Health and Safety Coordinator will perform investigations and responses consisting of one or more of the following actions in the event that Action Levels are exceeded:

- Verification of laboratory data and calculations.
- Analyze and review probable causes.

- Evaluate need for reanalysis or additional analysis on original sample.
- Evaluate need for resampling.
- Evaluate need for sampling of other pathways.
- Evaluate need for notifications to regulators
- Dose assessments/bioassays.

7.0 ATTACHMENTS

7.1 Table 1 *Derived Air Concentrations (DACs) and Effluent Air Concentrations of Selected Radionuclides in the Uranium and Thorium Series*

7.2 Minimum Detectable Concentration Calculation – Area Monitors

7.3 Minimum Detectable Concentration Calculation – PAM's

7.4 Radiological Air Sample Data Form – Area Monitors, Form SOP 212-10

7.5 Radiological Air Sample Data Form – PAM's, Form SOP 212-11

TEACHERS' RETIREMENT SYSTEM - GMO SITE

HEALTH AND SAFETY PLAN

ATTACHMENT 3

Title: Health and Safety Plan

Revision Number: 1

Date: July 23, 2001

Replaces: Version 1

TABLE OF CONTENTS

TABLES

FIGURES

EMERGENCY PHONE NUMBERS

IN THE EVENT OF AN EMERGENCY DIAL 911

AMBULANCE SERVICE	911
FIRE DEPARTMENT	911
EMERGENCY RESCUE SERVICE	911
POLICE DEPARTMENT	911
NATIONAL RESPONSE CENTER	1-800-424-8802
POISON CONTROL CENTER	1-800-732-2200
NORTHWESTERN MEMORIAL HOSPITAL	(312) 908-2000
ILLINOIS DEPARTMENT OF NUCLEAR SAFETY (IDNS) EMERGENCY NUMBER	(217) 785-0600
PROJECT COORDINATOR (Richard Berggreen)	(847) 279-2500
ILLINOIS EMERGENCY MANAGEMENT	(217) 782-7860
USEPA REGION 5 24-HOUR EMERGENCY NUMBER	(312) 353-2318

1.0 SCOPE OF PLAN

The following Health and Safety Plan (HASP) will be utilized and modified as necessary in order to minimize and prevent exposures to hazardous substances and conditions related to all excavation and restoration activities at the GMO site (Site). All personnel assigned to this project will be required to review thoroughly the contents of the HASP and to strictly adhere to the policies and procedures listed herein. This HASP is for use only by the Teachers' Retirement System of the State of Illinois (TRS) their designated contractors and consultants, and approved Site visitors. USEPA, and other agencies, are not considered visitors and will be required to conform to their own Health and Safety Plans.

This plan meets the requirements of OSHA 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, and applicable subparts of OSHA 29 CFR 1926, 1910 and 10 CFR. Visitors will be required to review the health and safety plan and read and sign the visitor information sheet (Figure 1.1).

FIGURE 1.1
VISITORINFORMATION SHEET
TEACHERS RETIREMENTS SYSTEM - GMO SITE

CAUTON. Radioactive materials are present on this site. Radioactive materials may be found throughout the site. Grounds, buildings and equipment have low levels of contamination.

VISITOR INFORMATION

NOTICE TO VISITOR: ALL VISITORS MUST BE ESCORTED AT ALL TIMES WHILE ON THIS SITE.

CONTROLLED AREAS: Do not enter areas with these signs unless you have an escort or health physics has given specific approval and you understand access limitations.

CAUTION CAUTION CAUTION

You must wear protective clothing in controlled areas. Health physics will provide you with instructions.

RADIATION CONTAMINATION AIRBORNE

You must wear a personal radiation dosimeter if you enter an area which is controlled.

No smoking, eating, drinking or chewing in controlled areas.
NO EXCEPTIONS.

Notify Health Physics if you do not understand these instructions.

AREA AREA RADIOACTIVITY

2.0 SAFETY MANAGEMENT

The following safety management structure will be utilized for the implementation, administration, and monitoring of the HASP.

2.1 Health and Safety Coordinator

The Health and Safety Coordinator (HSC), Mr. Glen Huber, shall assume overall responsibility for the HASP. The HSC or designee shall monitor and maintain quality assurance of the HASP until project completion. Principal duties of the HSC include:

- Review project background data,
- Approve all HASP modifications,
- Administer and enforce the HASP,
- Evaluate the adequacy of personal protective equipment (PPE) to be used by Site personnel,
- Conduct required on-site training except tailgate safety meetings that will be conducted by the Field Team Leader (Mr. Dumas Guerrier),
- Brief visitors on work Site conditions, and
- Administer personnel and perform ambient air monitoring procedures.

The HSC or designee has the authority to stop work in the event conditions develop which pose an unreasonable risk to Site personnel or persons in the vicinity.

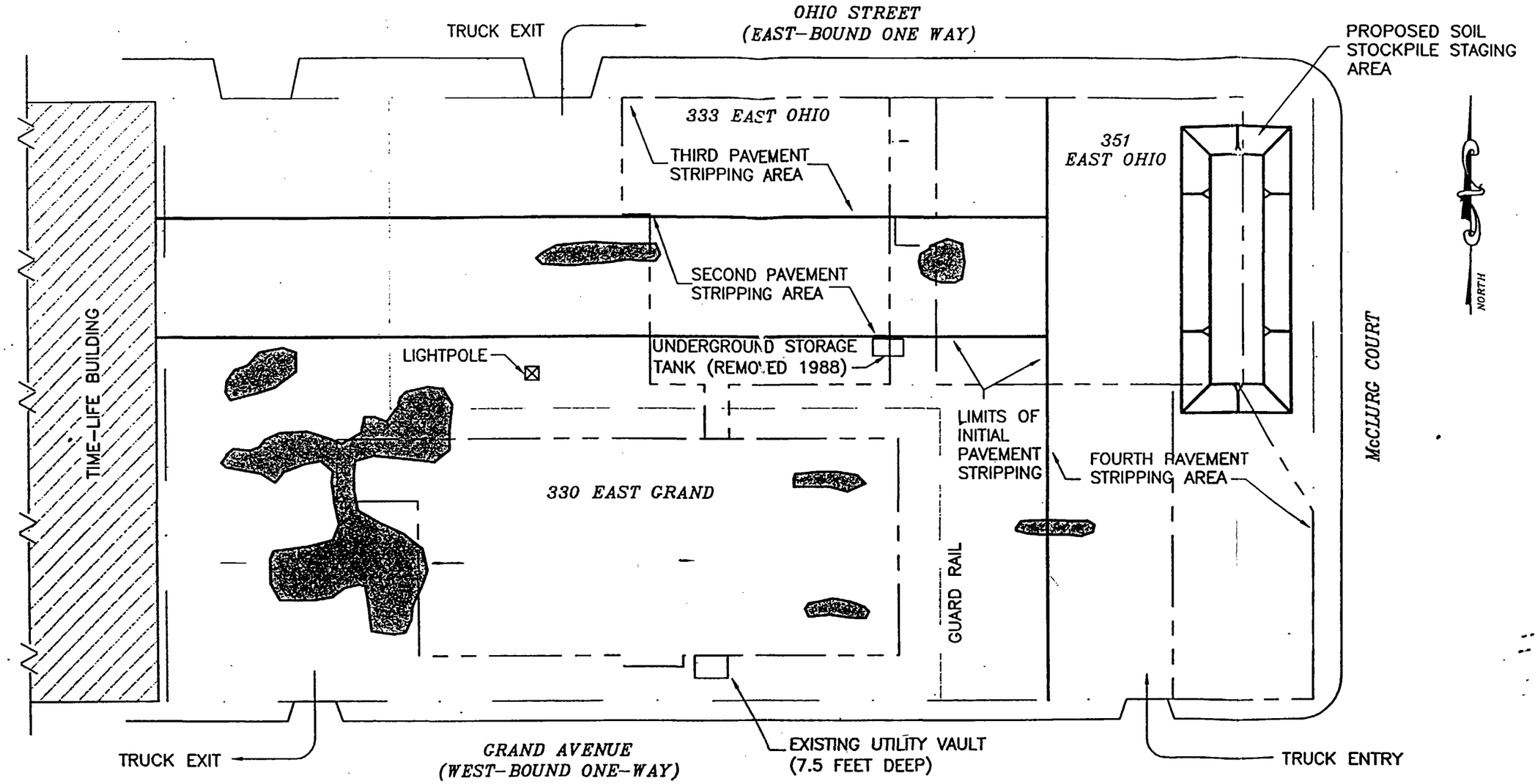
3.0 PERSONNEL RESPONSIBILITIES

The HSC or designee will administer and supervise the HASP at the work-site level. He will monitor all operations and will be the primary on-site contact for health and safety issues, and will have full authority to stop operations if conditions are judged to be hazardous to on-site personnel or the public.

The HSC will brief all Site personnel on the contents of the HASP. Personnel will be required to review the HASP, and have the opportunity to ask questions about the planned work or hazards. The Field Team Leader, Mr. Dumas Guerrier, will conduct tailgate safety meetings to familiarize the Site personnel with Site conditions, boundaries, and physical hazards. Site personnel will conduct their assigned tasks in accordance with the HASP at all times. As necessary, the Field Team Leader will conduct radiation training and provide briefings on radiation issues that arise during construction. These activities will take place as part of the tailgate safety meetings, or during special meetings to address more immediate concerns, dependent on the issues being addressed.

If at any time Site personnel observe unsafe conditions, faulty equipment or other conditions which could jeopardize personnel health and safety, they are required to immediately report their observations to the HSC or Field Team Leader.

Work zones will be established at the Site. These zones include clean/support zones, decontamination zones, and exclusion zones. Known impacted areas where exclusion zones are to be established during the removal effort are shown on Figure 3.1. Although the clean/support zones are anticipated to remain fixed, other zones will move about the Site as excavation work progresses.



LEGEND

IDENTIFIED RADIOLOGICALLY-IMPACTED AREAS

333 EAST OHIO — FORMER BUILDING LOCATIONS

SCALE IN FEET

0 40'

BASE MAP FROM GAIATECH, APRIL 2000

PAVEMENT STRIPPING, SOIL STAGING, ANTICIPATED TRAFFIC PATTERNS
GMO SITE
CHICAGO, ILLINOIS

DRAWN BY BWS	CHECKED BY MKK	APPROVED BY RGB
DATE 5-1-01	DATE 5-1-01	DATE 5-1-01

CADFILE X:\PROJECTS\25585-XG\01-LOC-DIAG.dwg

STS Consultants Ltd
Consulting Engineers

STS PROJECT NO. 25585-XG
STS PROJECT FILE 01-LOC-DIAG.dwg
SCALE 1"=40'±
FIGURE NO. 3-1

4.0 HAZARD ASSESSMENT

The following represents potential hazards associated with this project.

4.1 Principal Contaminants (Known or Suspected)

- Thorium: the entire thorium (Th-232) decay chain
- Uranium: the entire uranium (U-238) decay chain
- Radium: Ra-226 and Ra-228
- Radon: Rn-220 and Rn-222

The known total radium concentration present in the soil exceeds 3000 pCi/g for some locations within the project site. The following primary routes of entry to the body will be considered:

ROUTE	ENTRY MADE VIA:
Inhalation	Airborne dust containing heavy metal radionuclides and radon.
Ingestion	Airborne dust containing heavy metal radionuclides/contaminants.
	Improper or poor personal hygiene practices.
Eye and Skin	Direct contact with contaminants.
	Improper or poor personal hygiene practices.
	Airborne dust containing heavy metal/radionuclide contaminant.
	Cuts and abrasions.
Direct Exposure	Penetrating gamma radiation in air and soil.
	Exposure to X-rays.

4.2 Physical Hazards

Before field activities begin, the HSC will conduct a Site reconnaissance to identify any real or potential hazards created from Site activities. Physical hazards inherent to construction activities and power-operated equipment may exist.

4.2.1 Heat Stress

Field activities in hot weather create a potential for heat stress. The warning symptoms of heat stress include fatigue; loss of strength; reduced accuracy, comprehension and retention; and reduced alertness and mental capacity. To prevent heat stress, personnel shall receive adequate water supplies and electrolyte replacement fluids, and maintain scheduled work/rest periods.

The Field Team Leader or designee shall continuously visually monitor personnel to note for signs of heat stress. In addition, field personnel will be instructed to observe for symptoms of heat stress and methods on how to control it. One or more of the following control measures can be used to help control heat stress.

- Provision of adequate liquids to replace lost body fluids. Employees must replace body fluids lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst, 12 to 16 ounces every half-hour is recommended. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement. Replacement fluids can be commercial mixes such as Gatorade.
- Establishment of a work regimen that will provide adequate rest periods for cooling down. This may require additional shifts of workers.
- Breaks should be taken in a cool and shaded rest area (77 degrees is best).
- Employees shall remove impermeable protective garments during rest periods.

- Employees shall not be assigned other tasks during rest periods.

- All employees shall be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress.

4.2.2 Cold Stress

Field activities are not anticipated during cold weather; however, if the field activities occur during a period when temperatures average below freezing, the following guidelines will be followed.

Persons working outdoors in temperatures of 40 degrees and below may suffer from cold exposure. During prolonged outdoor periods with inadequate clothing, effects of cold exposure may even occur at temperatures well above freezing. Cold exposure may cause severe injury by freezing exposed body surfaces (frostbite) or result in profound generalized cooling, possibly causing death. Areas of the body which have high surface area-to-volume ratios such as fingers, toes and ears are the most susceptible to frostbite.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10° F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when external chemical-protective equipment is removed if the clothing underneath is perspiration-soaked.

Local injury resulting from cold is included in the generic term "frostbite". There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost nip or incipient frostbite: Characterized by sudden blanching or whitening of skin.
- Superficial frostbite: Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep frostbite: Tissues are cold, pale, and solid; extremely serious injury.

Prevention of frostbite is vital. Keep the extremities warm. Wear insulated clothing as part of one's protective gear during extremely cold conditions. Check for symptoms of frostbite at every break. The onset is painless and gradual - you might not know you have been injured until it is too late.

To administer first aid for frostbite, bring the victim indoors and rewarm the areas quickly in water 95° to 100°F. Give individual a warm drink - not coffee, tea, or alcohol. The victim should not smoke. Keep the frozen parts in warm water or covered with warm clothes for 30 minutes, even though the tissue will be very painful as it thaws; then elevate the injured area and protect it from injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep victim warm and get immediate medical care.

4.2.3 Electrical Hazards

Overhead power lines, downed electrical wires, buried cables and improper use of electrical extension cords can pose a danger of shock or electrocution. All Site personnel should immediately report to the Field Team Leader any condition that could result in a potential electrical hazard.

The Field Team Leader will notify Site personnel during the safety meetings of the locations of known underground cables and utilities.

4.2.4 Noise Hazard

Operation of equipment may present a noise hazard to workers. Site personnel will utilize hearing protection when noise levels are determined to be in excess of 29 CFR 1910.95 requirements. Noise monitoring will be performed to determine noise levels.

4.2.5 Overt Chemical Exposure

Typical response procedures include:

SKIN CONTACT:
Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention. Eye wash will be provided on-site at the work zone and support zone as appropriate. If affected, eyes should be continuously flushed for a minimum of 15 minutes.

INHALATION:
Move to fresh air and transport to hospital. Decontaminate as other actions permit.

INGESTION:
Transport to emergency medical facility. Decontaminate as permitted by other requirements.

PUNCTURE WOUND OR LACERATIONS:
Transport to emergency medical facility. Field Team Leader will provide Material Safety Data Sheets (MSDS) to medical personnel as requested. Decontaminate as permitted by other requirements.

4.2.6 Adverse Weather Conditions

In the event of adverse weather conditions, the Field Team Leader will determine if work can continue without endangering the health and safety of field workers. Some items to be considered before determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.
- Treacherous weather-related working conditions.
- Limited visibility.
- Potential for electrical storms or high winds.

4.3 Medical Evaluation and Surveillance Program

All field project personnel shall receive a medical evaluation in accordance with 29 CFR 1910.120. Personnel who receive a medical evaluation will be notified by the medical contractor as to the outcome of their evaluation. This will be in the form of a confidential report addressed to the individual and will contain a breakdown of the clinical findings. In addition, it will indicate any areas of concern which would justify further medical consultation by the individual's personal physician. In the event that the areas of concern are of a severe nature, a follow-up notification will be made to the individual by the medical consultant to answer any questions the employee may have.

4.3.1 Dosimetry/Personnel Monitoring

All project personnel shall participate in a dosimetry program administered by the HSC. (The dosimetry program shall comply with 32 IAC 340[1] , i.e. dosimeters shall be processed by a dosimetry processor accredited by the National Voluntary Laboratory Accreditation

[1] The IDNS regulations are usually more restrictive than US Nuclear Regulatory Commission (NRC) regulations. However, if there is a conflict between IDNS and NRC regulations, the NRC regulations will be used to determine compliance.

Program.) The HSC shall maintain records of all radiation exposures incurred by field personnel including all contractors. These records will be maintained in an up-to-date manner to comply with the requirements of 32 IAC 340.4010. The HSC shall review the results of personal exposure monitoring to determine compliance with exposure limit requirements.

4.3.2 Requirement for Dosimetry

Personal dosimetry is required for anyone who enters a radiologically controlled area in which he/she may receive in one calendar year a dose in excess of 10% of the limits in 32 IAC 340. Any person who works in a radiation area will be required to have a personal dosimeter. As a matter of policy, all individuals shall be required to use a dosimeter (either self-reading type, film badge or Thermoluminescence Detector (TLD)) whenever they enter the Exclusion Zone.

4.3.3 Bioassay

Bioassay is the determination of the types and amounts of radioactive materials, which are inside the body. By analyzing the rate of deposition, the rate of excretion, and any other available information regarding placement in the body, internal exposures from radioactive materials can be estimated.

Procedures for bioassay will be consistent with the previous Lindsay Light Health and Safety Plan. Bioassays are not anticipated to be required for the excavation and removal activities proposed, based on levels documented as present.

The decision to use bioassay shall be made by the Health and Safety Coordinator. In the event that a worker has an excessive intake or the potential to receive greater than 10% of the Annual Limit on Intake (ALI) , bioassay shall be ordered. Data from Lapel Air Samplers

shall be used as a factor in determining whether or not bioassay is warranted. If workers are found to have been present in locations where airborne radioactivity concentrations are found to be greater than 30% of the Derived Air Concentration, bioassay will be considered.

4.3.4 Emergency Medical Treatment

Emergency first aid should be administered on-site as appropriate. The individual should be decontaminated if possible, depending on the severity of the injury, and transported to the nearest medical facility, if needed. Treatment of the injury is of primary concern and decontamination a secondary concern. Levels of radioactive contamination at the Site could be acutely hazardous if decontamination is not undertaken during an emergency situation. The Field Team Leader will complete the appropriate incident report, if warranted. See Section 4.4, Accident and Incident Reporting.

An emergency first-aid station will be established and will include a first-aid kit for onsite emergency first aid.

Provisions for emergency medical treatment shall be integrated with the following guidelines:

- At least one individual qualified to render first aid and Cardiopulmonary Resuscitation (CPR) will be assigned to each shift.
- At least one individual trained in radiation emergency response will be assigned to each shift
- Emergency first aid stations in the immediate work vicinity.
- Conspicuously posted phone numbers and procedures for contacting ambulance services, fire department, police, and medical facilities.
- Maps and directions to medical facilities.

- Conspicuously posted evacuation routes and gathering area locations shall be posted around the Site.

4.4 Accident and Incident Reporting

All accidents, injuries, or incidents will be reported to the HSC. This accident/incident will be reported as soon as possible to the employee's supervisor. An Accident/Incident Form will be completed by the Field Team Leader, and a copy will be forwarded to the STS Project Manager. A copy of the form is shown as Figure 4.1.

FIGURE 4.1
ACCIDENT/EXPOSURE INVESTIGATION REPORT

COMPANY			DATE
INVESTIGATION TEAM			
EMPLOYEE'S NAME & ID			
SEX	AGE	JOB DESCRIPTION	
DEPARTMENT & LOCATION			
ACCIDENT DATE & TIME			
DATE & TIME ACCIDENT REPORTED TO SUPERVISOR			
NATURE OF INCIDENT			
NATURE OF INJURY			
REFERRED TO MEDICAL FACILITY/DOCTOR ☐ YES ☐ NO			
EMPLOYEE RETURNED TO WORK ☐ YES DATE/TIME _____ ☐ NO			
☐ INJURED EMPLOYEE INTERVIEW/STATEMENT - ATTACHED			
WITNESSES			
☐ WITNESSES INTERVIEWS/STATEMENTS ATTACHED			
☐ PHOTOGRAPHS OF SITE - ATTACHED			
☐ DIAGRAMS OF SITE - ATTACHED			
EQUIPMENT RECORDS - ATTACHED - REVIEWED	☐ YES	☐ NO	
ACCIDENT/EXPOSURE INCIDENT DESCRIPTION			

FIGURE 4.1
ACCIDENT/EXPOSURE INVESTIGATION REPORT

ACCIDENT DESCRIPTION		
DATE & TIME	LOCATION	
EMPLOYEES INVOLVED		
PREVENTIVE ACTION RECOMMENDATIONS		
CORRECTIVE ACTIONS COMPLETED	MANAGER RESPONSIBLE	DATE COMPLETED
EMPLOYEE LOST TIME - TEMPORARY HELP - CLEANUP - REPAIR - DISCUSSION		
ACCIDENT COST ANALYSIS	INVESTIGATION	COMPLIANCE	TOTAL COST
MEDICAL			
PRODUCTION LOSS			
REPORT PREPARED BY	DATE COMPLETED		
SAFETY COMMITTEE REVIEW	☐ YES	☐ NO	
CORRECTIVE ACTION	DATE STARTED		
SAFETY COMMUNICATION NOTICE PREPARED	DATE		
SAFETY DIRECTOR SIGNATURE			

FIGURE 4.1
ACCIDENT/EXPOSURE INVESTIGATION REPORT

ACCIDENT DESCRIPTION	
DATE & TIME	LOCATION
EMPLOYEES INVOLVED	
EMPLOYEE INTERVIEW/STATEMENT - INJURED EMPLOYEE - WITNESS	
EMPLOYEE NAME	
INTERVIEWED BY	

ACCIDENT DIAGRAM/PHOTOGRAPHS

5.0 TRAINING

All Site personnel shall be trained and certified in accordance with 29 CFR 1910.120.

5.1 Project- and Site-Specific Training

Prior to project start-up, all assigned personnel shall receive an initial project- and site-specific training session. This training shall include, but not be limited to, the following areas:

- Review of the Health and Safety Plan;
- Review of general radiation principles and compounds;
- Review of applicable radiological and physical hazards;
- PPE levels to be used by Site personnel;
- Site security control;
- Emergency response and evacuation procedures;
- Project communication;
- Required decontamination procedures;
- Prohibited on-site activities;
- Instructions to workers in accordance with 10 CFR 1912; and
- U.S. NRC Regulatory Guide 8.13 and Declared Pregnant Woman Policies (Females).

5.2 Visitor Orientation

All non-essential personnel and visitors who plan to enter the exclusion zone will be briefed on the HASP requirements and 10 CFR 1912 requirements prior to entry with a trained Site escort. In addition, female visitors will be instructed regarding U.S. NRC Regulatory Guide 8.13 and Declared Pregnant Woman Policies.

5.3 Safety Tailgate Meetings

Before the start of the work week, on Monday morning, the Field Team Leader will assemble the Site personnel for a brief safety meeting. Additional meetings will be conducted throughout the week, as needed, to address safety concerns and precautions. The purpose of these meetings will be to discuss project status, problem areas, conditions, safety concerns, PPE levels and to reiterate HASP requirements. The Field Team Leader will complete a Safety Meeting Report (Figure 5.1) to indicate the contents of the meeting and the attendees.

5.4 First Aid

At least one (1) individual, trained and qualified to administer first aid and CPR in accordance with American Red Cross requirements, who is also trained in radiological response, will be present at the Site.

5.5 Safe Work Permit

Site workers in special work conditions such as confined space, hot work, trenching, or other physical hazards, must be skilled at such work and trained to recognize these as special work conditions. Confined space is defined by OSHA 1910.146. Section 13 of this HASP contains further information on the confined space program to be followed.

Figure 5.2 shows the Safe Work Permit to be completed by the HSC and signed by workers for special work conditions.

Figure 5.3 show the issues which will be addressed in the event soil is encountered which exhibits low level contamination from an existing or former underground storage tank or other source of fuel or polynuclear aromatics (PNAs) contamination, such as tar, cinders, or coal ash.

FIGURE 5.1
SAFETY MEETING REPORT (Page 1 of 2)

DATE		DURATION OF MEETING	
		FROM: ☐ A.M. ☐ P.M.	TO: ☐ A.M. ☐ P.M.
NUMBER PRESENT	NUMBER ABSENT	MEETING CONDUCTED BY	DID MEETING INCLUDE REQUIRED TRAINING? ☐ YES (DESCRIBE BELOW) ☐ NO

HEALTH AND SAFETY COORDINATOR'S PRESENTATION	DISCUSSION OF SAFE/UNSAFE WORK PRACTICES, MATERIALS, PRECAUTIONS, HAZARDS, EQUIPMENT FAMILIARIZATION, ETC.
SITE WORKER FEEDBACK	COMMENTS, QUESTIONS, COMPLAINTS, ETC.
HEALTH AND SAFETY COORDINATOR'S CORRECTIVE ACTION PLAN	KNOWN PLANS FOR CORRECTION, PARTS ON ORDER, ITEMS TO BE DISCUSSED WITH DEPART. HEAD, AND CORRECTION OF ITEMS PREVIOUSLY SUBMITTED
PROJECT MANAGER'S COMMENTS	RESOLUTION OF QUESTIONS, ITEMS OR ISSUES RAISED IN MEETING OR WITH SUPERVISOR

HEALTH AND SAFETY COORDINATOR	PROJECT MANAGER
FIELD TEAM LEADER	HAVE SITE WORKERS ATTENDING SIGN ON REVERSE SIDE. FORWARD A COPY TO THE PROJECT COORDINATOR

FIGURE 5.1

SAFETY MEETING REPORT (PAGE 2 OF 2)

TO BE SIGNED BY ALL SITE WORKERS ATTENDING THE MEETING			
I HAVE RECEIVED AND UNDERSTAND THE INFORMATION AND/OR TRAINING INDICATED ON THE REVERSE SIDE.			
SIGNATURE	**DATE**	**SIGNATURE**	**DATE**

LIST ALL SITE WORKERS ABSENT FROM THE MEETING	

FIGURE 5.2
SAFE WORK PERMIT (Page 1 of 2)

COMPLETED PERMIT MUST BE POSTED AT THE ENTRY OR WORK SITE.

ISSUED BY	DATE	TIME (FROM) ☐ A.M. ☐ P.M.	TIME (TO) ☐ A.M. ☐ P.M.
ACCEPTED BY		RESPONSIBILITY TRANSFERRED TO (NAME)	
LIST ALL WORKS (ON BACK) OR ATTACH ROSTER			

SECTION 1 — GENERAL AREA WORK PERMIT

1. WORK LIMITED TO THE FOLLOWING: (DESCRIPTION AND AREA/EQUIPMENT)

2. *SAFETY EQUIPMENT (OTHER THAN AREA REQUIREMENTS)* ☐ *NONE*

☐ RAIN SUIT ☐ GLOVES ☐ FACE SHIELD ☐ GROUND FAULT CIRCUIT INT. ☐ AIR PACK (SCBA) ☐ FIRE RESISTANT CLOTHING
☐ CHEMICAL SUIT ☐ HEARING PROTECTION ☐ HOOD ☐ BARRICADES/WARNING SIGN ☐ SUPPLIED AIR ☐ LONG SLEEVES
☐ RUBBER BOOTS ☐ CHEMICAL GOGGLES ☐ FALL RESTRAINT DEVICE ☐ COMMUNICATIONS EQPT (EST) ☐ RESPIRATOR ☐ OTHER

3. THE PERSON RECEIVING THE PERMIT VERIFIES THAT ALL WORKERS:

A. HAVE BEEN THROUGH THE SAFETY ORIENTATION	☐ YES	E. KNOW THE LOCATION OF THE PHONE OR INTERCOM	☐ YES
B. UNDERSTAND APPLICABLE HAZCOM AND RADIATION REQUIREMENTS	☐ YES	F. KNOW THE PROCEDURES FOR SAFE JOB COMPLETION	☐ YES
C. HAVE DISCUSSED HAZARDS OF THE JOB AND AREA	☐ YES	G. HAVE INSPECTED ALL TOOLS/EQUIPMENT	☐ YES
D. KNOW THE LOCATION/USE OF SAFETY EQUIPMENT	☐ YES	H. UNDERSTAND THE CLEAN UP REQUIREMENTS	☐ YES

PERMIT RECEIVER INITIALS _____

4. POTENTIALLY AFFECTED AREA PERSONNEL AND WORKERS NOTIFIED OF WORK TO BE DONE ☐ YES ☐ N/A

5. THE FOLLOWING RESPONSIBILITIES HAVE BEEN COMMUNICATED TO THE PERSON RECEIVING THIS PERMIT:

☐ CONDITIONS FOR WORK STOPPAGE	☐ PERFORMING THE WORK SAFELY	☐ COMPLETION OF SECTION 6 AND PERMIT RETURN
☐ CREW ACCOUNTABILITY	☐ REPORTING CHANGES THAT AFFECT JOB SAFETY	

SECTION 2 — AIR TESTS

PRIOR TO ENTRY OR HOT WORK ☐ DOES NOT APPLY

TEST IN ORDER INDICATED

1. OXYGEN METER TEST PERFORMED	☐ YES ☐ N/A	READING	$\%O_2$	RANGE 19.5-23.5% O_2	TESTED BY	LOCATION OF TEST	TIME ☐ AM ☐ PM
2. COMBUSTIBLE GASES AND VAPORS TEST	☐ YES ☐ N/A	READING	%LEL	MAXIMUM 10% LEL	TESTED BY	LOCATION OF TEST	TIME ☐ AM ☐ PM
3. TESTS FOR TOXICS	☐ YES ☐ N/A	READING	☐ PPM ☐ MA/M³	PEL/TLV ☐ PPM ☐ MA/M³	TESTED BY	LOCATION OF TEST	TIME ☐ AM ☐ PM

SECTION 3 — HOT WORK

☐ DOES NOT APPLY

	YES	N/A		YES	N/A
1. FIRE EXTINGUISHER (TYPE) _____ IS IT FULL?			8. GROUND LEAD ATTACHED TO WORK		
2. SURVEY AREA FOR COMBUSTIONS AND OPENINGS, HOSES, TRENCHES, ETC.			9. PREVENTION OF HEAT EXPOSURE TO GASKET, SEALS, LINERS		
3. COMBUSTIBLE MATERIALS REMOVED OR PROTECTED			10. OTHER WORK IN AREA WHICH SHOULD BE STOPPED		
4. HEAT/SPARK CONTROL - TARPS, COVERS, WATER, ETC.			11. MATERIAL PRESENT WHICH EMITS VAPOR WHEN HEATED		
5. PRECAUTION TAKEN FOR HIDDEN COMBUSTIBLES			12. RADIANT HEAT TRANSFER CONSIDERED		
6. PURGE GAS USED. TYPE _____			13. EQUIPMENT OPERATING OR CONTAINS ORIGINAL CONTENTS		
7. *ADJACENT AREAS SAFE/SEWERS PROTECTED*			14. *DUCTS OR CONVEYORS PLUGGED OR PROTECTED*		

SECTION 4 — CONFINED SPACE

☐ DOES NOT APPLY

	YES	NO	N/A		YES	NO	N/A
1. CONFINED SPACE ENTRY REQUIRED?				5. HAVE AUTHORIZED ENTRANTS SIGNED OPPOSITE SIDE OF THIS FORM?			
2. SPACE TO BE ENTERED _____				6. HAVE DESIGNATED ATTENDANTS SIGNED OPPOSITE SIDE OF THIS FORM?			
3. PURPOSE OF ENTRY _____				7. HAVE ALL NECESSARY HAZARD CONTROL MEASURES BEEN TAKEN?			
4. IS SPACE A PERMIT-ENTRY SPACE? IF YES, COMPLETE OPPOSITE COLUMN				8. HAS ALL REQUIRED EQUIPMENT BEEN PROVIDED?			

SECTION 5 — TRENCHING/EXCAVATION

☐ DOES NOT APPLY

	YES	NO	N/A		YES	NO	N/A
1. HAS THE AREA BEEN INSPECTED FOR UNDERGROUND POWER LINES OR PRODUCT LINES?				4. HAVE PRECAUTIONS BEEN TAKEN IF THE TRENCH/EXCAVATION DEVELOPS INTO A CONFINED SPACE?			
2. DOES THE TRENCH REQUIRE SHORING/BRACING/SUPPORT?				5. HAVE OVERHEAD POWER/PRODUCT LINES BEEN REMOVED OR IDENTIFIED?			
3. HAS THE SOIL BEEN EVALUATED FOR STABILITY?				6. WILL LEAKING WATER OR RAIN WATER AFFECT THE STABILITY OF THE TRENCH/EXCAVATION?			

SAFE WORK PERMIT (Page 2 of 2)

SECTION 6	QUESTIONS TO BE COMPLETED ON PERMIT EXPIRATION OR JOB COMPLETION.		YES	NO	N/A		YES	NO	N/A
		1. HAS THE JOB BEEN COMPLETED?				5. HAVE SAFETY DEVICES BEEN REINSTALLED?			
	WORKER CLOSEOUT SIGNATURE	2. HAS THE AREA BEEN CLEANED OF WORK MATERIAL?				6. HAS HOT WORK AREA BEEN SURVEYED FOR SMOLDERING MATERIALS?			
	TIME ☐ AM ☐ PM	3. HAVE MANAGEMENT PERSONNEL BEEN INFORMED JOB IS DONE?				7. SPECIAL PRECAUTIONS, CONCERNS OR REMARKS			
		4. HAVE ALL LOCKS AND/OR TAGS BEEN REMOVED?				COMMENTS:			

OBSERVERS, WATCHERS, RESCUERS

I HAVE BEEN INSTRUCTED AS A CONFINED SPACE ATTENDANT, SAFETY WATCHER OR RESCUER AND UNDERSTAND MY DUTIES.

SIGNATURE	DATE	SIGNATURE	DATE

PERSONS AUTHORIZED TO PERFORM WORK AND/OR TO ENTER CONFINED SPACE

I HAVE BEEN INSTRUCTED IN AND AM AWARE OF THE POSSIBLE HAZARDS AND CONDITIONS I MAY ENCOUNTER IN THIS ENTRY WORK

SIGNATURE	TIME		DATE	SIGNATURE	TIME		DATE
	IN	OUT			IN	OUT	

COMMENTS

AUDIT PURPOSE ONLY

CORRECTIVE ACTIONS

COMPLETED BY

NAME	TITLE	DATE

FIGURE 5.3
SITE SAFETY PLAN
LOW CONTAMINATION OF FUEL,
PNAs IN SOILS

SUMMARY INFORMATION

DATE: _____ UPDATE: _____

PROJECT NAME: _____ PROJECT NO: _____

LOCATION: _____

SITE CONTACT AND PHONE NUMBER: _____

TYPE OF FACILITY: (active or inactive - describe previous use, previous agency action, soil type, topography, surrounding community)

PLAN PREPARED BY: _____

SITE SAFETY OFFICER: _____ CPR/FIRST AID TRAINED STAFF: _____

REVIEWED BY: _____ DATE: _____

WORK SCOPE/CONSTRUCTION/INVESTIGATION
Task 1 _____
Task 2 _____
Task 3 _____

PROPOSED START DATE: _____

UNUSUAL FEATURES/SITE SECURITY (include site map): _____

UTILITIES: ☐ Marked ☐ Scheduled Meet Date _____ Time _____

ANALYTICAL DATA (to be summarized below or attached, if available)
_____
_____

CONFINED SPACE: ☐ Yes ☐ No (If yes, describe and address permitting and entry procedures in an attachment.) _____
_____

AIR MONITORING:
Monitoring equipment: HNu meter with 10.2 eV lamp or _____
Action level = 15 PID units in breathing zone for Level C upgrade. Stop work = 50 PID units in breathing zone.
☐ 0_2 meter, ☐ FID, ☐ Detector tubes, ☐ L.E.L. meter, ☐ Other _____

Other action levels: _____

PERSONAL PROTECTION: Level of Protection: ☐ A ☐ B ☐ C ☐ D
Special Requirements _____

COMMUNICATION EQUIPMENT: (Mobile Phone or other phone location and number, etc.)

_____

Scheduled Safety Meetings Interval: (daily, weekly, as needed)

SPECIAL SITE EMERGENCY COMMUNICATION PROCEDURES: (Evacuation signals, routes, spill containment)

HEAT/COLD STRESS CONTROLS:

SPECIAL PHYSICAL HAZARD CONTROLS: Barricades for work area, reflective vests, other, etc.

_____

LOCAL EMERGENCY RESOURCES and telephone numbers
Emergency Eye Wash/Shower Location:
Fire Extinguisher: _____
Police: _____
Fire Department: _____
Poison Control: _____
HOSPITAL: _____
Address: _____
Telephone: _____
Directions (supply map): _____

_____

EMERGENCY CONTACTS (name and phone number)
1. Construction Manager Contact: _____
2. Owner Contact: _____
3. Contractor Contact: _____
4. Subcontractor Contact: _____
5. Subcontractor Contact: _____
6. _____
7. _____

PRE-ENTRY SAFETY BRIEFING
I have received and read the _____ Low Contamination Health and Safety Plan. I understand the plan and had the opportunity to ask questions. I understand the information and instructions in the plan. I understand that medicine can complicate the effects from exposure to toxic chemicals. If I am taking any prescription or over the counter medicine or have a current medical condition which may increase my risks, I will advise my supervisor or Site Safety Officer.

Signature	Responsibility	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____

6.0 COMMUNICATIONS

6.1 General Communications

The Field Team Leader will have available at the Site the means for telephone communications, or an equivalent means of communication, for summoning emergency assistance from the fire/ambulance and police departments in the event they are required. The telephone will also act as a direct link to technical personnel for information pertaining to all phases of the project.

6.2 Radio/Telephones

Short-range walkie-talkies or cellular telephones will be made available to designated personnel working at the Site.

6.3 Emergency Warning

In the event of an emergency condition, the Field Team Leader will notify project personnel verbally if all are within immediate hearing and via a bullhorn if the Site area is large. The Field Team Leader will also notify visitors present within the area. Site personnel will immediately proceed to a pre-designated assembly area as designated by the Field Team Leader during the daily safety meeting. Personnel will remain in the designated area until further instructions are received by the Field Team Leader.

All communication equipment will be tested at the beginning of each day to verify operational integrity.

6.4 Hand Signals

Hand signals will be used by field teams in conjunction with the buddy system. Hand signals shall be familiar to the entire field team before operations commence and should be reviewed during site-specific training.

Signal	Meaning
Hand gripping throat	Out of air; can't breathe
Grip partner's wrist	Leave area immediately; no debate
Hands on top of head	Need assistance
Thumbs up	OK; I'm all right; I understand
Thumbs down	No; negative

6.5 Site Security

Only authorized personnel will be permitted on the Site in accordance with the requirements of the Site Security Plan (Appendix 6 to the Removal Action Work Plan) and this HASP. Visitors and other non-essential personnel may enter the work area only upon authorization by the Field Team Leader. This restricted access will ensure that the Field Team Leader can communicate with each person authorized to enter the work area.

7.0 PERSONNEL EXPOSURE AND AIR QUALITY MONITORING

7.1 Air Quality (Dust)

Due to the nature of the principal contaminants associated with the project, dust suppression will be important as a means of minimizing exposure levels and off-site migration of contaminants. A key control measure to minimize exposure levels and off-site migration of contaminants will be a policy of "no visible dust". The Field Team Leader will routinely monitor the project area. The OSHA personal exposure limit (PEL) for nuisance dust is 15 mg/m3.

7.2 Airborne Radioactivity Monitoring

Monitoring for airborne radioactivity exposure is as important as monitoring for external radiation exposure. Monitoring for airborne radioactivity exposure requires the following elements:

- Air sampling for radioactive particulates,
- Recordkeeping regarding personnel work locations and time in location,
- Respiratory protective equipment records regarding devices used by workers in airborne radioactivity areas,
- Counting and analyzing air sample filters,
- Calculating air concentrations of radioactive material, and
- Comparing air concentrations to applicable air quality criteria

By closely monitoring these three elements, a continuous record of personnel exposure to airborne radioactivity is maintained.

Lapel samplers worn for personal air monitoring shall be utilized for airborne radioactivity monitoring any time a worker enters a radiological exclusion zone. The filters from the lapel samplers shall be analyzed the following day after use for comparison purposes to

assess the need for procedural changes. It is expected that naturally occurring radon and thorium daughters will interfere with analyses. Additional evaluation of samples shall be performed when determined necessary based upon elevated results. If sample analysis show concentrations greater than background levels a follow-up analysis shall be performed. The follow-up analysis shall be performed after four days to allow for the decay of the thoron daughter Pb-212 (10.6 hour half life). The "four day count" should be free from radon daughter interference and will serve as the official measurement of Th-Alpha.

Downwind monitoring of the excavation areas for radioactive particulate activity also will be performed. Low volume air samplers shall run continuously during operations and be evaluated on a daily basis for gross alpha activity. Comparisons will be made to 32 IAC 340 Appendix A to ensure that adequate radiological controls are in place for workers and the general public. As low as reasonably achievable (ALARA) concepts will be utilized when considering protective measures to ensure that internal exposures are minimized, while also considering the effects of such protective measures with respect to external exposures. Controls on the Site, such as wetting of soils and procedural changes, will be employed prior to the prescription of respiratory protective equipment.

High volume air samplers shall be utilized so that effluent air quality can be gathered on a daily basis. High volume air sampling allows for much shorter collection times than low volume sampling and has equivalent dust loading for needed collection durations. Both high and low volume air sampling require a sufficient volume of air to be collected in order for the Minimum Detectable Activity (MDA) to be below the most restrictive air effluent guidelines. Daily analysis of samples will allow for necessary procedural changes to be made and alert health and safety staff to potential problems on a continuous basis, rather than once per week.

Time decay of interfering nuclides generally refers to radon-222 decay and daughters but may also include thoron decay. The specific times for decay of samples is best addressed in procedures rather than in the health and safety plan.

After filters have been collected and decayed overnight, there will be a morning count of the filter that will serve to identify high gross counts for the previous day. This will alert health and safety staff of a potential problem which they can investigate more promptly. The count, after 4 days decay, will serve to be the official measurement of Th-Alpha.

7.3 Internal Monitoring

Internal monitoring to determine intakes of radioactive material will be performed as needed based upon the results of the air sampling program. Bioassay methods to be considered should include in-vivo, as well as in-vitro, assessments. Routine bioassay of workers is not anticipated based upon the low concentrations of radioactivity in soils to be excavated.

7.4 External Radiation Monitoring

External radiation monitoring of workers will be performed using film badges or thermoluminescent dosimeters. Dosimetry will be provided and processed by a service holding National Voluntary Laboratory Accreditation Program (NVLAP) certification. Pocket dosimeters may also be utilized for visitors and other infrequent personnel requiring access to the Site.

7.5 Radiological Surveys

Radiological surveys will be performed to ensure that radiation levels and contamination levels are within applicable guidelines for workers and the general public. Radiation surveys will be performed using the following instrumentation:

- Ludlum Model 2221 Portable Scaler/Ratemeter with 2"x2" NaI probe (or equivalent). This instrument will be used to conduct surface soil scans. Instrument specific action levels shall be used to determine approximate radiological soil concentrations. Any areas where the count rate is greater than the determined action level shall be considered exclusion zones and marked appropriately.

- Ludlum Model 3 Survey Meter with pancake G-M probe (or equivalent). This instrument will be used to conduct surveillance surveys of both personnel and equipment leaving exclusion zones. The action level for both equipment and personnel surveys is any count rate that exceeds background level. Decontamination procedures detailed in section 9.0 of the HSP will be used when contamination is located.

- Ludlum Model 3 Survey Meter with 1"x1" NaI probe "MicroR meter" (or equivalent) and Eberline Model RO-2 Ion Chamber (or equivalent). These instruments will be used periodically to ensure that dose rates in work areas as well as the Site perimeter are below prescribed levels. The action levels for both on and off site are detailed in Section 7.8 of the HSP in Table 7.1

Airborne radioactivity measurements will be performed as described in the Air Monitoring Plan (Appendix 8 to the Removal Action Work Plan).

7.6 Contamination Monitoring

Samples shall be obtained periodically in work areas to ensure that radioactivity is present at acceptable levels and is prevented from leaving the Site: Decontamination of elevated areas will be performed to maintain contamination at levels that are ALARA.

Before leaving the exclusion zone, Site personnel shall be checked through use of a hand-held frisker to ensure that contamination is not present on skin or clothes. The frisker will be a Ludlum Model 3 survey meter with a pancake G-M probe (or equivalent). The Field Team Leader will be immediately informed regarding any contamination on individuals and will initiate appropriate decontamination techniques. Proper disposition of contaminated personal effects and clothing also will be the responsibility of the Field Team Leader.

7.7 Total Organic Vapor Monitoring

In addition to the radiological contaminants, there is a very slight potential of encountering organic vapors. Thus, no routine screening for organic vapors will be conducted during the removal action. However, if organic odors are observed during the field work screening for total organic vapors will be conducted with a photoionization detector (PID), or similar type equipment, on a daily basis. The screening will evaluate ambient photoionization volatile organic vapors and some semivolatile organic vapors.

Total organic vapors in ambient air will be obtained periodically with a PID during daily field activities. The PID provides real-time readings of exposure to volatile organics and. some semi-volatile organics. Measurements will be made daily, prior to activities, to determine background levels. Monitoring measurements will be taken when:

- operations change,
- work moves to a different portion of the Site, and
- personnel observe contaminated materials.

These screening operations will be used to identify conditions requiring an upgrade to full-face respirators as described in Section 7.8.2.

7.8 Action Levels

7.8.1 Radiological Action Levels

Radiological action levels for on-site workers will be determined by performing surveillance surveys as well as airborne particulate monitoring for the presence of radioactivity. Properly trained Health Physics Technicians will perform radiological monitoring. The radioactive contamination on the Site is particulate and insoluble in water. Therefore, there will be no fixed contamination on the workers. Action levels as determined by radioactive monitoring can be found in Table 7.1.

To avoid the need for upgrade of personal protection equipment due to airborne contamination, engineering controls such as the use of water to minimize dust levels will be implemented as necessary during excavation and restoration activities.

7.8.2 Organic Vapors Action Levels

STS Consultants, Ltd. is taking a conservative approach to organic vapor monitoring at the Site. A PID will be used to periodically monitor for organic vapors or when odors indicated the possibility of organic contamination. Operations will be discontinued if the PID reads 5 ppm[2] or greater and the area will be evacuated. The Site Health and Safety Officer will retest the area wearing a full-face respirator. Operations will not resume until the PID reads less than 5 ppm, and remains below 5 ppm.

[2] PID level obtained for Benzene from NIOSH Pocket Guide to Chemical Hazards.

TABLE 7-1

ACTION LEVELS AS DETERMINED BY RADIOACTIVITY

Note: Personnel shall not be exposed to airborne radioactivity such that their weekly intake exceeds 12 Derived Air Concentration (DAC)-hours without prior approval of the Field Team Leader or designee.

Level of protection may be increased to Level C (full-face air purifying respirator) when airborne monitoring indicates that contamination levels have reached 30% of the DAC. All assessments shall incorporate ALARA principles. Engineering controls shall be used prior to assignment of respiratory protective equipment.

Signs shall be posted at entrances to areas where airborne radioactivity levels exceed, or have the potential to exceed, 25% of the DAC.

The most restrictive DAC of the nuclides which may be present onsite is Th-232. The DAC for Th-232 Class W is $5x10^{-13}$ uCi/ml. The air effluent limit is $4x10^{-15}$ uCi/ml. Engineering controls will be utilized so that no visible dust is present and airborne radionuclide concentrations will be kept ALARA.

Radiation Type	Action Level	Level of Respiratory Protection/Action
a. Contamination on smear samples of equipment	33 dpm/100 cm^2 gross alpha	Decontamination required prior to release for unrestricted use.
b. Contamination surveys of personnel or equipment	Count rate greater than background levels	Decontamination required prior to leaving exclusion zone.
c. Airborne Radioactivity	30% DAC[(c)]	Consider Level C (full-face APR) based upon ALARA evaluation. Ensure proper posting. Consider internal monitoring
d. Ambient Gamma (work areas)	5 mrem/hr[(d)]	Consider procedures for shielding of soils. Ensure proper posting.
e. Ambient Gamma (off-site areas)	2 mrem/hr[(e)]	Implement immediate controls to reduce dose equivalent rate.

Notes

(c) Potential Airborne Radioactivity Area as defined in 10 CFR 20. Workers with 1000 DAC-hours per year to date must wear modified Level C (full-face APR) until the end of the calendar year.

(d) The ambient gamma dose equivalent rate action level of 5 mrem/hr stems, from the 10 CFR 20 radiation area definition. If the ambient gamma dose equivalent rate reaches 2 mrem/hr, one or more of the following actions will be implemented: The source may be shielded; the working distance from the source may be increased; or the worker's exposure time may be limited.

(e) The ambient gamma action level for off-site is based upon the 10 CFR 20 requirements to maintain dose equivalent rates in unrestricted areas such that they do not exceed 0.002 rem in any one hour.

8.0 PERSONAL PROTECTIVE EQUIPMENT

It is anticipated that most excavation activities in designated exclusion zones can be conducted in Level D personal protective equipment (PPE), with a contingency upgrade to Level C, based on the action levels listed in Section 7. Level C will be used when required by Special Work Permits, or when directed by the Field Team Leader.

Level D personal protective clothing and equipment for excavation activities includes:

- Coveralls, disposable or washable through a contaminated clothing vendor. Coveralls are to be removed at the boundary of the exclusion zone.
- Hard hat
- Chemical resistant, OSHA approved safety shoes/boots
- Cotton or leather gloves
- Safety glasses
- Dust mask (optional)

Level C protective clothing and equipment includes:

- Full-face air-purifying respirator (NIOSH/MSHA approved) fitted with radionuclides/HEPA cartridges and/or organic vapor cartridges, depending on which action levels are exceeded (see Section 7 of this HASP)
- Coveralls
- Tyvek coveralls - required in areas when splashing by contaminated soils or water is a possibility
- Cotton or leather gloves
- Disposable latex inner gloves - required in areas when splashing by contaminated soils or water is a possibility
- Nitrile outer gloves (taped) - required in areas when splashing by contaminated soils or water is a possibility
- Chemical-resistant steel toe boots
- Hard hat

Action levels used to determine the need to upgrade or downgrade the levels of protection are described in Section 7 of this HASP.

9.0 CONTAMINATION REDUCTION PROCEDURES

9.1 Equipment

Portable equipment will be decontaminated with soap and water and rinsed with tap water. Heavy equipment will be steam-cleaned with water and, if necessary, a detergent solution. It is not anticipated that chemical cleaning will be necessary for decontamination.

9.2 Personnel

If levels of radioactivity show that individuals can remove coveralls and other personal protective clothing and equipment before leaving the exclusion zone and, thus complete decontamination, the individuals may leave the exclusion zone. If, however, levels of radioactivity show that individuals cannot achieve decontamination by the removal of coveralls and showering is required, they will be dressed in clean coveralls, boots and gloves and be transported to Northwestern Memorial Hospital to complete decontamination.

If substantial skin contamination occurs on an individual working with radioactive materials, the following specific procedures should be followed to prevent fixation of the material in the skin or absorption of the radioactivity through the skin.

> Immediate Action: Notify the HSC or Field Team Leader, who will supervise the decontamination. If contamination is spotty, the HSC or Field Team Leader will supervise the cleaning of the individual spots with swabs, soap, or water. If the contamination is general, the HSC or Field Team Leader may recommend washing the area gently in warm or cool water (not hot) using hand soap (not detergent) for one minute. Rinse, dry, and monitor for radioactivity. This soap wash step may be repeated three times.

Evaluation: If the above procedure fails to remove all the skin contamination, the treatment should cease. An evaluation of the skin contamination should be performed by the HSC or Field Team Leader including an estimate of the dose commitment to the skin, and the quantity and identity of the nuclides contaminating the skin If additional decontamination steps are necessary, they are performed and documented by the HSC. The guidelines for Personnel Decontamination in the Radiological Health Handbook, HEW 1970, beginning on page 194, can be used as applicable. **CAUTION**: Do not use chemicals for personnel decontamination until full evaluation of the contamination is made by the HSC or Field Team Leader.

9.3 Contamination Prevention

Work practices that minimize the spread of contamination will reduce worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

- knowing the limitations of all personal protective equipment being used

  avoiding walking through areas of obvious or known contamination
- refraining from handling or touching contaminated materials directly. Do not sit or lean on potentially contaminated surfaces
- ensuring personal protective equipment has no cuts or tears prior to donning
- fastening all closures on suits, covering with tape if necessary
- taking steps to protect against any skin injuries
- staying upwind of airborne contaminants

- When working in contaminated areas, refraining from eating, chewing gum, smoking, or engaging in any activity from which contaminated materials may be ingested

9.4 Disposal Procedures

All discarded materials, waste materials, or other field equipment and supplies should be handled in such a way as to preclude the spread of contamination, creating a sanitary hazard, or causing litter to be left on-site. All potentially contaminated waste materials (e.g., clothing, gloves) shall be monitored and segregated in accordance with monitoring results into either radioactive or non-radioactive waste. Appropriate labels shall be affixed to all containers of radioactive materials.

10.0 GENERAL WORK PRECAUTIONS

10.1 General Work Precautions

The following general work precautions apply to all Site personnel.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in the work area.
- Hands and face must be thoroughly washed upon leaving the work area. Wash water will be provided at the Site for this purpose.
- Whenever levels of radioactivity warrant, the entire body should be thoroughly washed, as soon as possible, after the protective coveralls and other clothing are removed as part of the decontamination process.
- No facial hair that interferes with a satisfactory fit of the mask-to-face-seal is allowed on personnel required to wear respirators.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, discolored surfaces, kneel on ground, lean, sit, or place equipment on drums, containers, or the ground.
- Medicine, drugs and alcohol may interfere with or impair judgment and reaction times. Therefore, usage of prescribed drugs must be specifically approved by a qualified physician and made known to the Field Team Leader prior to an individuals' presence on the work-site. Alcoholic beverage intake is strictly prohibited at the Site and prior to work.
- All personnel must be familiar with standard operating procedures and any additional instructions and information contained in the HASP.
- All personnel must adhere to the requirements of the HASP.
- Contact lenses are not permitted when respiratory protection is required or where the possibility of a splash exists.

- Personnel must be cognizant of symptoms for radiological exposure onsite, for heat stress and cold stress, and knowledgeable regarding emergency measures contained in the Emergency Contingency Plan.

- Respirators shall be cleaned and disinfected after each day's use or more often, if necessary.

- Prior to donning, respirators shall be inspected for worn or deteriorated parts. Emergency respirators or self-contained devices will be inspected at least once a month and after each use.

- Each employee shall be familiar with the project's Respiratory Protection Program.

10.2 Operational Precautions

The following operational precautions must be observed at all times.

- All Site personnel shall be adequately trained and thoroughly briefed on anticipated hazards, equipment to be worn, safety practices to be followed, emergency procedures, and communications.

- All required respiratory protective devices and clothing shall be worn by all personnel going into areas designated for wearing protective equipment.

- All Site personnel shall use the buddy system when wearing respiratory protective equipment. At a minimum, a third person, suitably equipped as a safety backup, is required during extremely hazardous entries.

- During continual operations, on-site workers act as a safety backup to each other. Off-site personnel provide emergency assistance.

- Personnel should practice any unfamiliar operations prior to undertaking the actual procedure.

- Entrance and exit locations shall be designated and emergency escape routes delineated. Warning signals for Site evacuation must be established.

- Personnel and equipment in the contaminated. work area should be minimized, consistent with effective Site operations.

- Work areas for various operational activities shall be established.

- Procedures for leaving a contaminated area shall be planned and implemented prior to going on-site. Work areas and decontamination procedures shall be established based on expected Site conditions.

- Frequent and regular inspection of Site operations will be conducted to ensure compliance with the HASP. If any changes in operation occur, the HASP will be modified to reflect those changes.

11.0 SANITARY FACILITIES

11.1 Potable Water

a. An adequate supply of potable drinking water shall be maintained at all times immediately outside the Site. Drinking water shall meet all federal, state and local health requirements.
b. Drinking water shall be supplied to project personnel via approved dispensing sources.
c. Paper cups shall be permitted for the drinking of potable water supplies.
d. Drinking water dispensers shall be clearly marked and shall, in no way, have the potential for contamination from non-potable supplies.
e. Site personnel must be fully decontaminated prior to approaching the drinking water supply.

11.2 Toilet Facilities

a. Adequate toilet facilities shall be provided at the Site.
b. These facilities shall be in the form of portable chemical toilets.
c. Routine servicing and cleaning of the toilets should be established with the selected contractor and shall be in accordance with federal, state, and local health regulations.
d. Site, personnel must be fully decontaminated prior to approaching the toilet facilities.

11.3 Washing Areas

a. Adequate washing areas shall be provided for personal use within the work area.
b. Washing areas shall be maintained in a sanitary condition and will be provided with adequate supplies of soap, towels for drying, and covered waste receptacles.
c. Washing areas shall be maintained and sanitized daily.
d. No eating, drinking or smoking shall be permitted in the work area. This policy will be strictly enforced by the Field Team Leader.

12.0 FIRE CONTROL EQUIPMENT

An adequate number of approved portable fire extinguishers (class rated A, B and C) shall be readily available at the Site at all times.

All Site personnel shall be trained in the use of the extinguishers. Extinguishers shall only be used on outbreak stage fires or fires of minor nature. The local fire department shall be contacted in the event of a larger fire and Site evacuation procedures should be commenced in accordance with the procedures described in the Emergency Contingency Plan.

13.0 CONFINED SPACE PROGRAM

13.1 Purpose

In the event that confined space work is a necessity, a Confined Space Program will be implemented. Training in the recognition of confined spaces is a component of the health and safety training program.

The purpose of the Confined Space Program is to establish procedures to protect personnel from this serious hazard in the course of their work; and at a minimum, to comply with 29 CFR OSHA 1910.146. This document assigns responsibilities and sets standards for personnel engaged in activities where confined spaces may be present.

13.2 Responsibilities

13.2.1 Health and Safety Coordinator

The Health and Safety Coordinator administers the Confined Space Program. The Health and Safety Coordinator's responsibilities include:

- Review of the HASP for potential confined space hazards and design alternative approaches to accomplish the confined space tasks;
- Coordinating and managing the Confined Space Program in the event one is required;
- Establishing priorities for implementation of the program;
- Assisting with recognition and implementation of the Confined Space Program;
- Advising project management on confined space issues; and

- Communicating the Confined Space Program to personnel by training related to specific Site activities.

13.2.2 Project Manager

The Project Manager directs the application of the Confined Space Program to project work. The Project Manager is responsible for:

- Working with the Health and Safety Coordinator to prepare information describing activities that might be conducted in a confined space area;
- Assuring that all personnel engaged in project activities are familiar with the definition of a confined space;
- Assuring that personnel .are familiar with .the Confined Space Program, and that project activities are conducted in compliance with the Confined Space Program;
- Assuming the responsibilities of the Field Team Leader if another person is not assigned these responsibilities.

13.2.3 Field Team Leader

The Field Team Leader is responsible for the implementation of the Confined Space Program on-site during field activities. The Field Team Leader is responsible for:

- Overseeing implementation of the Confined Space Program during field operations; and
- Reporting confined space work activity, and any violations of the Confined Space Program, to the Project Manager and the Health and Safety Coordinator.

13.2.4 Personnel

Personnel are responsible for:

- Familiarizing themselves with the Confined Space Program and following it;
- Becoming familiar with the criteria for determining a confined space, and with the monitoring, permitting, and other requirements of the program; and
- Reporting immediately a confined space condition to the Field Team Leader.

13.3 Definition of a Confined Space

Confined space means a space that:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work
2. Has limited or restricted means for entry or exit (such as pits, storage bins, hoppers, crawl spaces, and storm cellar areas)
3. Is not designed for continuous employee occupancy

Any workspace meeting all of these criteria is a confined space and the Confined Space Program must be followed.

13.4 Confined Space Entry Procedures

13.4.1 Safety Work Permit Required

All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. The Safe Work Permit for entry into a confined space must be completed before work begins; it verifies completion of the items necessary for confined space entry. The Permit will be kept at the Site for the duration of the confined space work. If there is an interruption of work, or the alarm conditions change, a new Permit must be obtained before work begins.

A permit is not required when the space can be maintained for safe entry by 100% fresh air mechanical ventilation. This must be documented and approved by the Health and Safety Coordinator. Mechanical ventilation systems, where applicable, shall be set at 100% fresh air.

The Field Team Leader must certify that all hazards have been eliminated on the Entry Permit. If conditions change, a new permit is required.

13.4.2 Pre-entry Testing for Potential Hazards

a. Surveillance

Personnel first will survey the surrounding area to assure the absence of hazards such as contaminated water, soil, or sediment, barrels, tanks, or piping where vapors may drift into the confined space.

b. Testing

No personnel will enter a confined space if any one. of these conditions exists during pre-entry testing. Determinations will be made for the following conditions:

1. Presence of toxic gases or dusts: Equal to or more than 5 parts per million (ppm) on the organic vapor analyzer with an alarm, above background outside the confined space area; or other action levels for specific gases, vapors, or dusts as specified in the Health and Safety Plan and the Confined Space Permit based on knowledge of Site constituents;

2. Presence of explosive/flammable gases: Equal to or greater than 10% of the Lower Explosive Limit (LEL) as measured with a combustible gas indicator or similar instrument (with an alarm); and

3. Oxygen Deficiency: A concentration of oxygen in the atmosphere equal to or less than 19.5% by volume as measured with an oxygen meter.

Pre-entry test results will be recorded and kept at the Site for the duration of the job by the Field Team Leader. Affected personnel can review the test results.

c. Authorization

Only the Field Team Leader and the Health and Safety Coordinator can authorize any personnel to enter into a confined space. This is reflected on the Safe Work Permit for entry into a confined space. The Field Team Leader must assure that conditions in the confined space meet permit requirements before authorizing entry.,

d. Safe Work Permit

A Safe Work Permit for confined space entry must be filled out by the Health and Safety Coordinator or Field Team Leader. A copy of the Safe Work Permit is included as Figure 5.2.

e. Attendants

One worker will stand by outside the confined space ready to give assistance in the case of an emergency. Under no circumstances will the standby worker enter the confined space or leave the standby position. There shall be at least one other worker not in the confined space within sight or call of the standby worker.

f. Observation and Communication

Communications between standby worker and entrant(s) shall be maintained at all times. Methods of communication that may be specified in the Safe Work Permit and the HASP may include voice, voice by powered radio, tapping or rapping codes, signaling tugs on rope, and standby worker's observations that activity appears normal.

13.4.3 Rescue Procedures

Acceptable rescue procedures include entry by a team of rescuers only if the appropriate self-contained breathing apparatus (SCBA) is available; or use of public emergency services.

The standby worker must be trained in first aid, CPR, and respirator use. A first aid kit should be on hand and ready for emergency use. The standby worker must be trained in rescue procedures. Retrieval of an unconscious victim in a confined space will only be

conducted by trained rescue personnel. An emergency call to 911 will be initiated to assist the victim.

13.5 Training

Personnel who will engage in field activities will be given annual training on the requirements and responsibilities in the Confined Space Program and on OSHA 1910.146. Only trained personnel can work in confined spaces. Workers should be experienced in the tasks to be performed, instructed in proper use of respirators, lifelines and other equipment, and practice emergency procedures and self-rescue.

Before each Site activity, the determination of confined space work will be part of the Site characterization process. Training in the site-specific confined space activities will be part of the site-specific health and safety training:

13.6 Safe Work Practices

- Warning signs should be posted. These include warnings for entry permits, respirator use, prohibition of hot work and emergency procedures and phone numbers.
- Cylinders containing oxygen, acetylene or other fuel such as gasoline must be removed a safe distance from the confined space work area.
- Purging and ventilating is done before work begins to remove hazardous vapors from the space. The space should be monitored to ensure that the gas used to purge the space (e.g. tank) has also been removed. Local exhaust should be used where general exhaust is not practical.
- The buddy system is used at all times. A standby person always must be posted within sight of, or in communication with, the person inside the confined space. The standby should not enter the confined space, but instead will call for help in an emergency and not leave the post. Communication should be maintained at all times with workers inside the confined space.

- Emergency planning in the HASP and a Safe Work Permit must be approved in advance and the proper rescue equipment must be immediately available.

14.0 ELECTRICAL LOCKOUT/TAGOUT

The Field Team Leader must approve all work in areas requiring lockout/tagout procedures. Specific procedures and permitting requirements will be specified in the HASP, or in a revised HASP based on the need for a worker to work around electrical equipment.

All systems must be locked out and tagged before the work begins. This includes pipes, air lines, electrical equipment and mechanical devices. The equipment must be start tested and approved for use by a worker by the Health and Safety Coordinator or the Field Team Leader by start-testing to make sure the locked-out equipment does not operate.

GLENN A. HUBER

President
Stan A. Huber Consultants, Inc.
New Lenox, IL

EXPERTISE

Radiation Safety Consulting, Regulatory Compliance, Decontamination and Decommissioning Projects

EDUCATION

Illinois Institute of Technology, Chicago, IL
Master of Health Physics Degree, August 1999

University of Illinois, Champaign, IL
Bachelor of Science Degree - Marketing, May 1994

Stan A. Huber Consultants, Inc., New Lenox, IL
Forty Hour Hazwoper Training, October 1998

Grella Consulting, Inc./S. A. Huber Consultants, Inc.
Regulations for the Safe Transport of Radioactive Materials, March 1995

Ludlum Measurements, Inc., Sweetwater, TX
Calibration and Repair of Ludlum Measurements Instruments
August 1998

EXPERIENCE

August 1994 - Present
Industrial Radiation Safety/ Decontamination Consultant

Responsibilities Include:

- Decontamination and Decommissioning Projects*
- NORM Projects*
- Radiation Safety Audits
- Leak Testing and Inventory Services for Industrial Facilities
- Perform Site Surveys, Soil Sampling and Removable Contamination Surveys
- Nuclear Gauge Removal and Shipping, Preparation and Packaging of Waste for Disposal
- Emergency Response Services

*Specific Projects Include:

* Keystone Steel & Wire Company, Peoria, IL, 12/92 - 1/93 & 8/94 - 10/94
* Border Steel Mills Co., El Paso, TX, 11/95 - 2/96
* AMOCO Oil Co., Whiting, IN, Semi-Annual Radiation Safety Services
* US Steel, Gary, IN, Quarterly Radiation Safety Services and Audits
* Case Property NORM Remediation Project, Brookhaven, MS, 3/96 - 1/98
* Procter & Gamble, Ross, OH, 12/98
* Lindsay Light II, North Columbus Drive Site, Chicago IL 3/2000 – 11/2000

AREAS OF SPECIALIZATION

- *Troxler Nuclear Density Testing*
- *Heavy Equipment Operator*
- *CERCLA Hazardous Waste Training*
- *48-Hour Supervisor*
- *Certified Well Driller*
- *Environmental Technician*
- *CPR and First Aid Training*
- *Commercial Drivers License, Class B*
- *RAD Worker Level II Training*
- *Certified OSHA Safety Supervisor*
- *Soil*
- *Concrete*
- *Geotechnology*

FOREIGN LANGUAGES

- *Fluent in French and Spanish*

Representative Experience

Serves as field supervisor on environmental projects with over 25 years of experience in soil boring, well installation and special testing. Responsible for the safety of drill crews and environmental protocol.

- Master Driller in charge of field drilling operations for world's tallest building. Responsibilities included drilling, sampling, preparing borings for pressuremeter testing and Goodman Jack testing.
- Performed as Master Driller for the United Center and Comisky Park. Involved with drilling, sampling, pressuremeter testing and the installation of inclinometers.
- Acted as crew leader for borings performed at Fermi National Accelerator Laboratory. These borings included coring and sampling and were completed under difficult access and working conditions inside the enclosure for the B0 project.
- Master Driller involved with a project for Ohio Department of Transportation involving borings performed on alum sludge ponds where an all-terrain drill rig was driven on to the alum ponds with the help of geotextiles. Special testing procedures including vane shear testing, Osterberg piston sampling and over fifty 3 inch undisturbed samples.
- Responsible for drilling and coring on the Dresden Island Dam spillway with all-terrain drill and gas powered skid rigs.
- Master Driller in charge of drilling at O'Hare International Airport retention pond. Borings were performed at night under winter drilling conditions. Special sampling procedures were needed to account for full sample recovery from 80 foot borings. Sampling methods included Moss sampler, Osterberg sampler, Giddings sampler, and Pitcher Barrel sampler.
- Has provided drilling expertise for geotechnical high-rise foundation projects throughout the City of Chicago.
- Served as Master Driller for an environmental project in

Kalamazoo, Michigan with borings in excess of 350 feet depth. Special sampling included the use of a hydropunch water sampling device.

Versed in the operation of the following drill rigs:

Mobile B-61HD, B-57, B-47
CME 750, 550, 55, 45
Diedrich D-50
Joy 12B
Joy 12B gas skid rig
Acker air powered skid rig
Electric skid rid
Longyear 65

Drilling and sampling methods utilized:

Rotary
Solid Flight Augers
Hollow Stem Augers
Rock Coring
Shelby Tube Sampling 2"/3"/5"
Split Spoon Sampling 2"/3"/5"
Osterberg Piston Sampling
Giddings Sampling
Packer Testing
Pitcher Barrel Sampling

- Serves as field supervisor in the operation and maintenance of STS' 23-ton cone penetrometer vehicle. Responsible for the performance of electric standard and piezocone tests, installation of PVC mini-wells, direct push soil sampling with two and three inch split spoons and shelby tubes, and gamma logging. Representative projects include:
- Supervisor of direct push soil sampling, mini-well installation and gamma logging to depths of 40 feet for the DOE Palos Park Environmental Project near Chicago, Illinois. Performed over 90 test locations over a 2 month period under stringent environmental and radioactive guidelines.
- Operator of electric CPT test equipment to delineate stratigraphy to depths of 75 feet at a plant in Superior, Wisconsin. Work was performed in January during hard

ground conditions and included automatic decontamination of rods and self-grouting of holes in creosote impacted soils.

- Assistant in the performance of electric piezocone, mini-well installation and hydropunch groundwater sampling in very dense glacial till at the Argonne National Laboratory 317/319/ENE site characterization.
- Site Safety Officer for Kerr-McGee radioactive project in West Chicago, Illinois.
- Supervisor at Lindsay Light project in Chicago, Illinois.
- Water treatment monitoring for KMRC in state and out-of-state.
- Monitoring soil remediation site.

Keith A. Carlson, CIH
Senior Industrial Hygienist

AREAS OF SPECIALIZATION

- *Industrial Hygiene Monitoring*
- *Chemical Safety/Spill Training*
- *OSHA Compliance*
- *Indoor Air Quality*
- *DOT HAZMAT training*
- *School/Hospital/ Laboratory Health and Safety*

EDUCATION

M.S., Industrial Hygiene, University of Minnesota, 1978

B.A., University of Minnesota, 1974

CERTIFICATIONS

Certified by the American Board of Industrial Hygiene, Comprehensive Practice 1980, Indoor Air Quality 2000

40-Hour Hazardous Material/Emergency Response Training

8-Hour Hazardous Material Site Supervisor Training

Certified Asbestos Building Inspector, State of Minnesota

Representative Experience

Mr. Carlson has over 20 years of experience in the recognition, evaluation and control of occupational hazards found in the workplace. Representative experience includes:

- Chemical exposure quantification and hazardous material risk management activities.
- Oversight and implementation of indoor air quality investigations. Specifics include:
  - Development of questionnaire
  - Staff interviews
  - Facility/HVAC inspections
  - Air sampling (e.g., mold, chemicals, carbon dioxide, air volumes)
  - Reports and presentations

  Mr. Carlson has carried out at a minimum, 400 indoor air quality investigations in the private and public sector, and many investigations for homeowners.
- Chemical compliance programs. Specifics include:
  - MSDS System
  - Environmental Compliance (e.g., Form R, SARA, RCRA requirements)
  - DOT training
  - UFC, UBC, NFPA issues
- Development and presentation of safety training courses/classes (e.g. Employee Right to Know, Confined Space Entry, Lock-out Tag-out, Personal Protective Equipment, Process Safety, Hazmat/Spill/DOT Training).
- Development of written safety programs (e.g. AWAIR, Employee Right to Know, Respirator Lock-out Tag-out, Confined Space Entry).
- Occupational Safety and Health (OSHA) type safety and health inspections. This includes both safety and chemical exposure compliance activities.
- Instructor for Midwest Center for Occupational Health and

AFFILIATIONS

Member, American Academy of Industrial Hygiene

Member, American Industrial Hygiene Association (National and Upper Midwest Chapter)

Member, American Conference of Governmental Industrial Hygienists

Member, American Society of Safety Engineers

Midwest Center for Occupational Health and Safety (Instructor)

Minnesota Safety Council

Safety (1982 – Present). Topics include Indoor Air Quality, Air Pollution, and Hazardous Materials.

- Design and testing at local exhaust ventilation systems.
- Expert witness testimony.

Publications and Presentations

Presentation at the American Industrial Hygiene Association, "Facility Surface Dust Containing Lead from Soldering Operations", Atlanta, Georgia, May 1998.

Indoor Air Quality, Minnesota RIMS Seminar, February 1998.

OSHA Safety and Health Care Facilities, Minnesota Health Care Facilities, Minnesota Health Care Conference, September, 1997.

"Risk Assessment in the Clinic and Ambulatory Setting", Safety for Health Risk Management, November 1996.

"Indoor Air Quality", Internal Facilities Manager's Association, August, 1995.